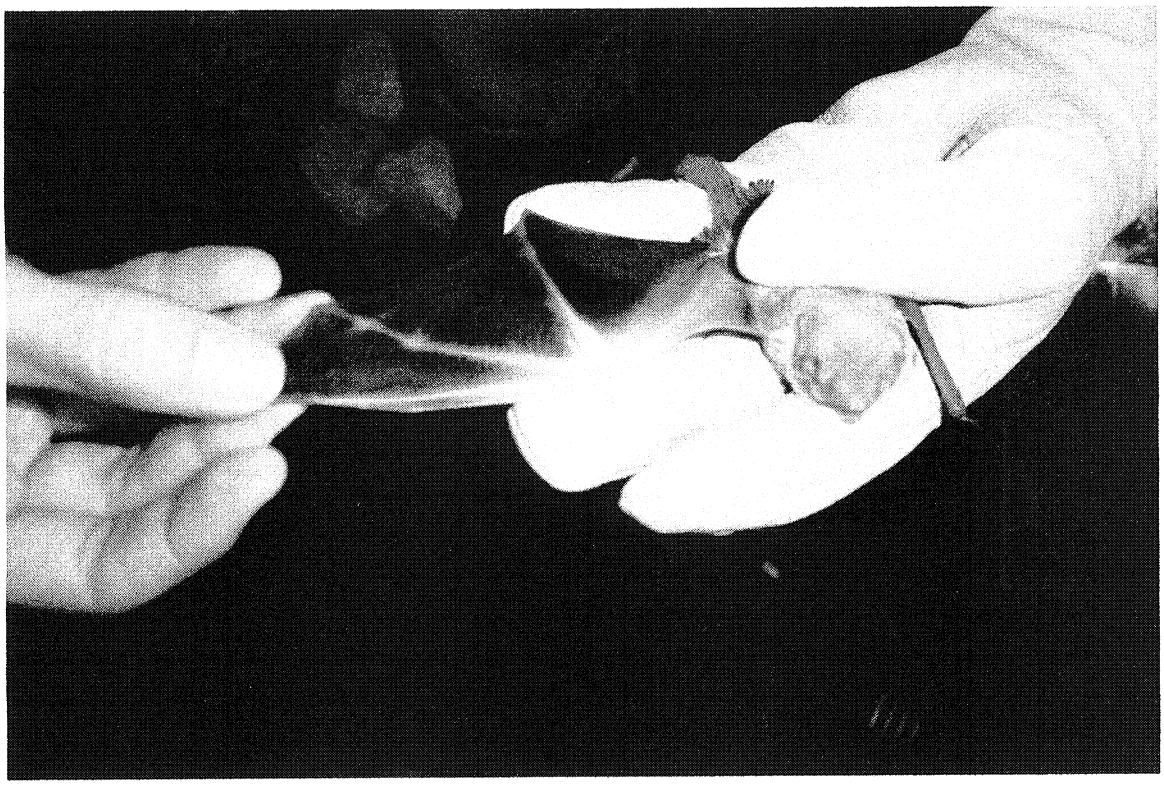
San Antonio Missions National Historical Park
Bat Inventory

Final Report
23 September 2003



Prepared by Meg Goodman, TPWD/BCI
and Jim Kennedy, BCI

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SUMMARY

Bat Conservation International (BCI) was contracted by the Los Compadres [Friends group of San Antonio Missions National Historical Park (SAAN)] to conduct a bat inventory at SAAN. This effort involved a literature review, direct capture of bats, acoustic bat surveys and day-time roost surveys. The literature review identified 6 species that may potentially occur at SAAN throughout the summer period; *Myotis velifer* (cave myotis), *Pipistrellus subflavus* (Eastern pipistrelle), *Lasiurus borealis* (Eastern red bat), *Lasiurus intermedius* (Northern yellow bat), *Tadarida brasiliensis* (Mexican free-tailed bat), and *Nycticeius humeralis* (evening bat), and one species, *Lasiurus cinereus* (hoary bat), only likely to occur during the spring/fall migration period. Efforts by BCI biologists through September 2002 documented three of these species at two different sites, including a new record for the evening bat for Bexar County. Bats captured at Padre Park and Mission San Juan sites included eight evening bats, one red bat and four northern yellow bats. Additional acoustic monitoring further documented *Lasiurus borealis* at Espada Dam, and *Tadarida brasiliensis, Lasiurus borealis, Lasiurus cinereus, and Nycticeius humeralis* at Rancho de las Cabras. All but *Lasiurus borealis* are new county records for Wilson County. Thus the checklist to date is five of the seven anticipated species, as follows:

Lasiurus intermedius -Northern yellow bat
Nycticeius humeralis - evening bat
Lasiurus borealis -Eastern red bat
Lasiurus cinereus - hoary bat
Tadarida brasiliensis - Mexican free-tailed bat

The Alamo Area Chapter of the Master Naturalists assisted BCI biologists with the mistnetting effort and conducted acoustic surveys at SAAN identifying bat activity "hot spots". Mission San Juan demonstrated consistently high bat activity, and the majority of bats were netted there, suggesting this would be a valuable site to monitor in the future.

Copies of all data sheets are provided as Appendix 1.

INTRODUCTION

The National Park Service (NPS) has set an objective of documenting the presence of at least 90% of all animal species occurring within a park unit's boundaries. To reduce costs, the NPS inventory program will cluster individual park units so that data can be collected at several locations simultaneously. It is intended that the data for all park units will be collected in accordance with clearly defined protocols. SAAN is considered part of the Gulf Coast network of the NPS system in Texas. The bat inventory at SAAN sponsored by Los Compadres is a part of the NPS-wide inventory project. BCI was contracted by Los Compadres on 7 June 2002 to

conduct a baseline inventory of bat species on SAAN sites. This involved the compilation of existing information as well as the collection of new information.

Due to their unique ecological features, bats present a unique challenge to those attempting to sample them in the field. Bats are volant, highly mobile, often colonial, and only active at night. They show considerable variation in their use of areas on a daily and seasonal basis, they tend to be clumped in suitable roost or foraging sites rather than being uniformly distributed, and they tend to avoid repeated trapping. In searching for an NPS standard protocol for surveying bats in individual park units, only one monitoring protocol was found on the NPS Inventory & Monitoring Protocol Database as a source reference. This is for Organ Pipe Cactus National Monument (OPCNM), Arizona. This was written in 1995 based on information gathered in 1993 (Petryszyn 1995). It is now very out of date (Walsh, pers comm.). It does not reference the use of bat detector technology for surveys, and it does not give standard sampling effort guidelines. Due to a the lack of a clear protocol, project leaders Meg Goodman, State Bat Coordinator for Texas Parks and Wildlife Department (TPWD) and BCI, and Jim Kennedy, Cave Resources Specialist at BCI, developed an approach in consultation with Dr. Allyson Walsh, Conservation Science Director at BCI. The approach followed the guidelines set out in the OPCNM protocol (including the use of standard data collection forms for bat captures), with the addition of heterodyne bat detector surveys. The sampling effort level was determined by balancing recommendations gleaned from the most recent literature with logistical and budgetary constraints.

This report summarizes the efforts throughout the survey season, presents some simple management recommendations based on the survey results, and concludes with recommendations for a standard bat inventory and monitoring protocol.

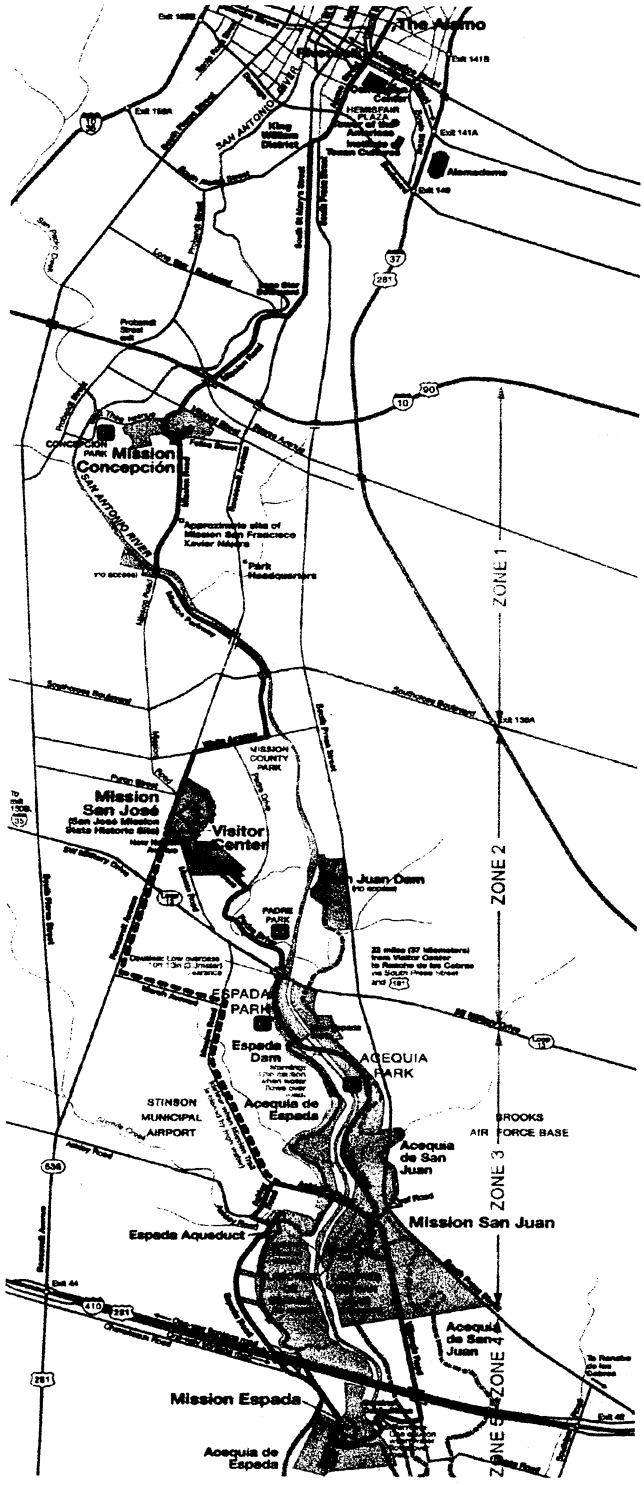
METHODS

Survey area — SAAN is made up of four closely situated missions in Bexar County, Texas and one disjunct site (Rancho de Las Cabras) near Floresville, Wilson County. All sites in Bexar County are relatively uniform, consisting of habitat aggregations of parkland enclosing sections of the San Antonio River, historic acequias (irrigation ditches), various separated small woodlots and old fields. The Wilson County site is more diverse consisting of open fields and low-lying deciduous woodlands along the San Antonio River and associated Picosa Creek. For the purposes of estimating sampling effort – these sites were therefore considered as one survey unit. However, in order to clearly divide the survey area into units of a suitable size for single night surveys, we divided the survey area into 6 zones. These are defined clearly in Figure 1 as well as described below to enable accurate repeat surveys to be conducted in the future.

Zone 1 includes the SAAN management properties between I-10/US 90 southward to Southcross Boulevard. Mission Concepción and the Park Headquarters are included within Zone 1.

Zone 2 includes the areas of SAAN between Southcross Boulevard and Military Drive. Mission San José, Padre Park and San Juan Dam are included within Zone 2.

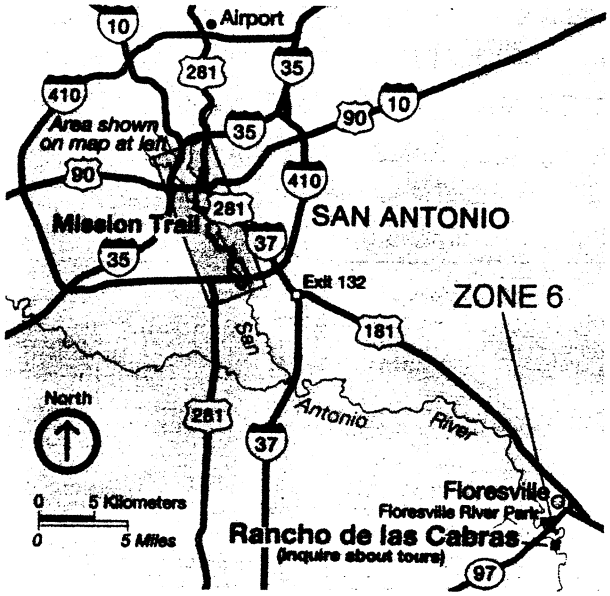
Zone 3 includes the areas of SAAN between Military Drive and Ashley Road/South Presa Street. Espada Park, Acequia Park and Espada Dam are included within Zone 3.



Zone 4 includes the areas of SAAN between Ashley Road/South Presa Street and I-410/US 281. Mission San Juan and Espada Aqueduct are included within Zone 4.

Zone 5 includes the areas of SAAN south of I-410/US 281. Mission Espada is included within Zone 5.

Zone 6 is located near Floresville, Wilson County, Texas. Rancho de las Cabras is the only site included within Zone 6.



Figures 1 and 2. Bat Survey Zones 1 through 6. Map based on SAAN park brochure

Bat sampling design and survey effort — Principle sampling methods for bats applied were evening capture by mist net and harp trap following standard set procedures (Kunz and Kurta 1988). These were supplemented with daytime visual surveys of potential roosts and evening acoustic bat activity surveys using heterodyne and ANABAT bat detectors.

Original survey effort targeted 6 to 11 nights of trapping spread between all zones within the park where trapping methods were appropriate. Some zones were not netted at due to the unsuitability of the habitat for netting. More survey effort was placed on the more productive zones (Weller and Zabel 2001). Survey effort in 2003 focused on acoustic detection using ANABAT detectors.

Literature Review — Prior to fieldwork, a background literature review was conducted to identify any previous bat monitoring efforts and/or for bat specimen records in the area. Records searched included specimens recorded in The Bats of Texas (Schmidly 1991), records reported to BCI's Range Map Project (A. England, pers. comm.), records reported to the TPWD Biological Conservation Database, and records reported to the Texas Cooperative Wildlife Collection (TCWC) housed at Texas A&M University. This initial query suggested that no previous bat surveys had been conducted at SAAN, but provided a list of potential species that would be refined through field surveys and habitat assessment. Schmidly listed 6 potential species from Bexar (San Antonio) and Wilson (Floresville) counties, including: cave myotis from "San Antonio", Somerset and West Hightower (all Bexar County); Eastern pipistrelle from "San Antonio", Johnsons (Gladsomes [sic]) Cave, and Kelly Air Force Base (all Bexar county); Eastern red bat from "San Antonio" and Somerset (Bexar county) and Floresville (Wilson County); hoary bat from "San Antonio" and Cubbra Springs (Bexar County); Northern yellow bat from "San Antonio" (Bexar County); and Mexican free-tailed bat from Helotes, Helotes Creek, "San Antonio", Fort Sam Houston Military Reservation, Mitchell Lake, Somerset, and Camp Bullis Military Reservation (all Bexar County). Two other species were erroneously listed as vagrants for Bexar County, Mormoops megalophylla (ghost-faced bat) and Eptesicus fuscus (big brown bat), and were later removed from our list of potential species. Finally, (evening bat), was added to the list even though Schmidly listed no prior records from Bexar or Wilson counties, as those are well within the range of that bat and adequate habitat exists on SAAN properties. This narrowed our focus to seven species (Table 1).

Table 1. Potential Bat Species of SAAN

Myotis velifer	cave myotis
Pipistrellus subflavus	Eastern pipistrelle
Lasiurus borealis	Eastern red bat
Lasiurus cinereus	hoary bat
Lasiurus intermedius	Northern yellow bat
Tadarida brasiliensis	Mexican free-tailed bat
Nycticeius humeralis	evening bat

BCI's mapping database added records of 5 bridge roosts in Bexar County on I-10 and 3 on I-35, most likely Mexican free-tailed bats, in addition to the records previously mentioned. BCI records also add one red bat from Government Canyon (Bexar County), and one cave myotis from Stockdale (Wilson County) to the list of records from those two counties. No records had been reported to the Texas Biological Conservation Database. Checking with the Texas Cooperative Wildlife Collection (TCWC) turned up 4 records for Mexican free-tailed bat,1 for hoary bat, and 1 for Northern yellow bat, in all of Bexar County.

Historical References — Towards the end of this project, SAAN Chief Ranger Dan Steed gave the principle investigators a draft copy of an unpublished NPS paper on the architectural history of the San Antonio Missions (Ivey et al. 1990). The portion of Chapter 9 ("The Post-Colonial Period") describing the bats in Mission Concepción is reprinted below in its entirety [emphasis on bat references ours]. The bats described were most likely *Tadarida brasiliensis*, although it is possible they were *Myotis velifer*.

The year 1846 saw another visitor to Mission Concepción. In an article, "Notes from my Knapsack," an anonymous soldier – somewhat lacking in historical knowledge – described Concepción:

> The "Mission Concepción" is one of the numerous structures for quasi-religious purposes, created by the Spanish Jesuits for the conversion of Indians to Romanism. They are all now deserted, and abandoned literally "to the moles and **bats**," and there is nothing visible in the condition of Mexican or Indian, to indicate any knowledge or any appreciation of the pure doctrines and divine morality of the New Testament. From an imperfect inscription now almost obliterated, on the building – which is stone and of stately appearance – it seems to have been erected or completed in the year 1754. But little is left of the interior finish, and that hardly visible, as the building was so darkened by **bats** and so offensive that the entrance was almost impossible. ("Notes from my Knapsack" 1854:176)

In recollections written between 1855 and 1861, ex-soldier Samuel Chamberlain also reiterates the gruesome state of Concepción in the late 1840s. Chamberlain's mention of caverns entered from steps "behind the altar" lends credence to local tales about subterranean passages:

> One day Colonel Harvey ordered the old Mission to be cleaned out, intending to use it to store forage for his command. A large detail of Dragoons well provided with shovels and brooms commenced to clean out the nave of the Church. The floor was covered to the depth of two foot with the excrement of **Bats**. While some of the detail were at work, others provided themselves with torches to explore the subterranean vaults and passages under the buildings and said to connect with the Fortress of the Alamo. Behind where the Altar formerly stood, a flight of stone steps descended into the dark and gloomy place. It was one mass of **Bats**! They hung on the walls and arched roof in clusters like bees when swarming, the floor was covered, and yielded under the step like a bog. Out of sport some of the Dragoons fired their Pistols into the living, squirming mass, when like a tornado the **Bats** flew out of the passage, extinguishing the torches but fortunately carrying the men out of the vault with them. The party in the Church rushed for the door in the wildest alarm and though some were knocked down and badly frightened, all got outside in safety. The little **winged animals** poured out of the great door for two hours, making their way to the Mission of San José, six miles below, their column being so dense as to resemble a suspension bridge! Thousands lay in the church and on the ground dead and dying from the crush. The stench in the Mission prevented its being used. (Chamberlain 1956:43-44)

Bartlett's description of Concepción reveals that the appalling condition of the mission church had not been remedied by 1854. At this time it was in use as a stable for cattle:

> It was late when we reached Concepción, which is nearer the town than either of the other missions. The two towers and dome of the church make quite an imposing appearance when seen from a distance; but on approaching it, we found it not only desolated but desacrated; the church portion being used as an inclosure for cattle, the filth from which covered the floor to the depth of a foot or more. Myriads of **bats** flitted about, which chattered and screamed at our invasion of their territory; and we found nothing of interest within the church to repay us for encountering their disagreeable presence. (Bartlett 1854:44)

It is interesting that these reports are not only some of the earliest documentation of bats using man-made structures as roosts in Texas, but also (particularly Chamberlain's account) provide some of the earliest evidence of human vandalism at bat roosts in the state.

Basic Natural History of the Potential Bats of SAAN — Below we provide a brief natural history description for the potential bats of the SAAN. We also provide a discussion of the likelihood of capture and of acoustic detection. Although some of these bats are less common than others, none are considered species of concern by either state or federal agencies at this time. Much of this information is also summarized in Table 2. Representative sonograms of typical bat calls for those species, or similar species, are depicted. Sonograms, where uncredited, are courtesy of http://talpa.unm.edu/batcall.

Table 2. Natural History and Capture Likelihood of Potential SAAN Bat Species

Species	Overwinter Strategy	Summer Roost Type	Summer Roosting Strategy
Cave Myotis (*Myotis velifer*)	Hibernates	Caves, Mines, buildings, bridges	Colonial
Eastern Pipistrelle (*Pipistrellus subflavus*)	Hibernates	unknown	Solitary to small groups
Eastern Red Bat (*Lasiurus borealis*)	Hibernates	Tree foliage	Solitary
Hoary Bat (*Lasiurus cinereus*)	Hibernates	Tree foliage or tree bark	Solitary
Northern Yellow Bat (*Lasiurus intermedius*)	Active year-round, occasional torpor	Spanish moss and dead palm fronds	Solitary
Mexican free-tailed bat (*Tadarida brasiliensis*)	Migrates	Caves, buildings, bridges, bat houses	Colonial, very large groups
Evening Bat (*Nycticeius humeralis*)	Unknown	Tree cavities, loose bark, bat houses	Small groups

The **cave myotis** (*Myotis velifer*) is a fairly common bat in Texas that forms nursery colonies, usually numbering in the thousands, in caves, mines, barns, buildings, and sometimes under bridges. Cave myotis are aerial insectivores and feed on a wide variety of insects including moths, weevils, antlions, beetles, and other small insects (Tuttle 2003). Because these bats congregate in large groups, they are very susceptible to human disturbance. The likelihood of detecting this cosmopolitan bat in SAAN is good. Its high maneuverability enables it to feed in the riparian areas we selected for netting, although its tendency to forage high among the treetops makes its chance of capture less. This should be one of the more common bats detected acoustically in SAAN, echolocating at a frequency of approximately 40-60 kHz.

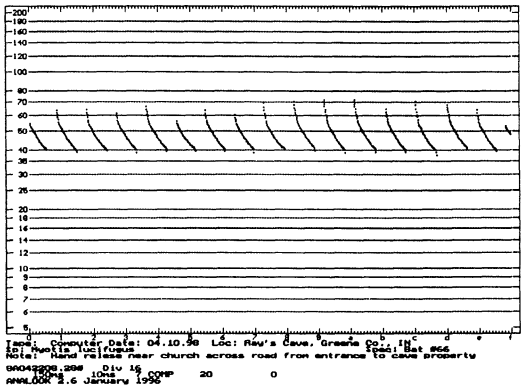


Figure 3. Sonogram of *Myotis lucifugus* calls, which are very similar to *Myotis velifer*.

The **Eastern pipistrelle** (*Pipistrellus subflavus*) is a common bat in Texas found throughout much of the state, but little is known about its daytime, summer, or maternity roosts, although they have been noted to occasionally use buildings, highway culverts, and abandoned woodpecker holes. In the winter they hibernate in caves. Eastern pipistrelles cannot withstand freezing temperatures and are among the first bats to enter hibernation in the fall and among the last to emerge in spring. These bats are among the first bats to emerge at dusk each night from forested lowlands. Their diet consists of small insects, including leafhoppers, beetles, flies, moths and flying ants (Tuttle 2003). These bats have been commonly collected along bottomland streams and forest flyways making it highly likely to be caught in the riparian areas we selected for netting. These bats are somewhat easy to detect acoustically as they are among the first to emerge at dusk and have a 42-55 kHz call.

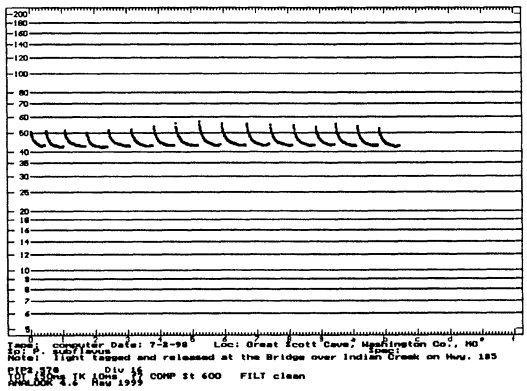


Figure 4. Sonogram of *Pipistrellus subflavus* calls. Courtesy of Dr. Eric Britzke.

The **Eastern red bat** (*Lasiurus borealis*) is a common tree bat throughout the state of Texas. This bat roosts out in the open in the foliage on lowland forest trees. They are well camouflaged as they hang curled up in their furry tail membranes, suspended from one foot, twisting slightly in the breeze (Tuttle 2003). For the most part they are solitary, only coming together to mate and to migrate. Unlike most bats, red bats often give birth to twins and can have litters of up to 5 bats. Red bats can be seen feeding in early evening around forest edges, in clearings, or around streetlights, where they primarily consume moths. It is likely that this bat will be captured along the riparian areas we selected for netting. In addition, these bats are somewhat easy to detect acoustically as they are among the first to emerge at dusk and echolocate at 35-60 kHz.

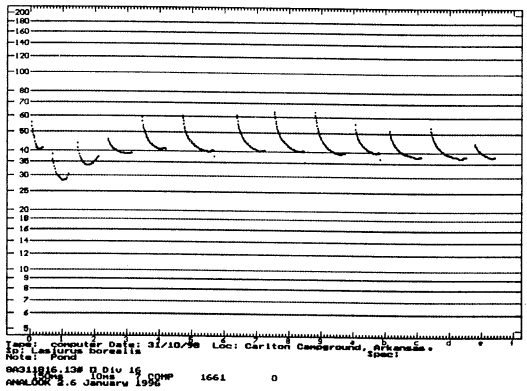


Figure 5. Sonogram of *Lasiurus borealis* calls.

The **hoary bat** (*Lasiurus cinereus*) is rarely encountered in Texas, as it is largely only a spring and fall migrant in the state. Hoary bats occur in a wide variety of habitats and feed mostly on moths (Tuttle 2003). This bat is easy to distinguish in flight due to its large size and the chatting sounds it makes during flight (Schmidly 1991). Because the hoary bat is largely only a spring and fall migrant through Texas the likelihood of catching this bat at SAAN in very low. However if acoustic sampling was conducted during the spring/fall migration then it is likely to pick up this bat on a detector, as they travel in groups and the call range is known to be from 20-35 kHz.

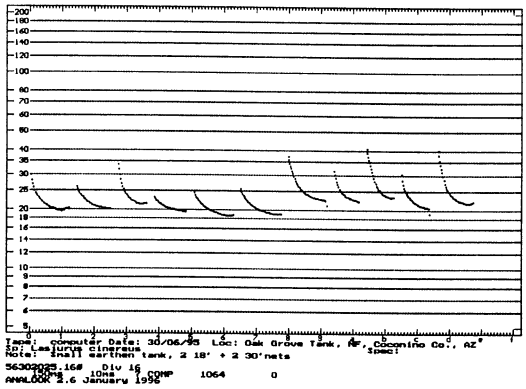


Figure 6. Sonogram of *Lasiurus cinereus* calls.

Northern yellow bats (*Lasiurus intermedius*) live in a variety of mostly coastal habitats that contain Spanish moss of fan palm trees (Tuttle 2003). Northern yellow bats prefer to forage over open, grassy areas such as pastures, lake edges, golf courses, and forest edges. These bats feed on leafhoppers, flies, mosquitoes, beetles, flying ants, and occasionally dragonflies and damselflies (Tuttle 2003). Lately there has been a trend of planting fan palms for landscaping which may provide the yellow bat with additional roosting sites if the dead palm fronds are not pruned. This, along with the selected netting sites near a forest edge, gives us a fair chance of catching this bat. The likelihood of detecting this bat acoustically is also good, at 32-50 khz.

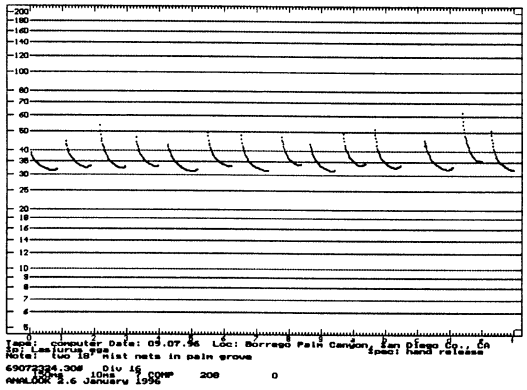


Figure 7. Sonogram of *Lasiurus xanthaninus* calls, which are similar to *Lasiurus intermedius*.

The **Mexican free-tailed bat** (*Tadarida brasiliensis*) is the most common bat encountered in Texas. This bat is a highly colonial, migratory bat that forms large maternity colonies in central Texas caves in the summer. The largest maternity colony is located near the community of

Garden Ridge, approximately 20 miles north of SAAN. Mexican free-tailed bats have easily adapted to human structures and often inhabit buildings, bridges, and bat houses. These bats are known to feed on agricultural pests, particularly the cotton boll worm moth and corn ear worm moth, as well as other night-flying insects. These bats feed on the wing generally out in the open as their wing-structure is made for sped and not for maneuverability. Although it is likely the Mexican free-tailed bat is present within SAAN, it is somewhat unlikely that this bat will be captured along the fairly restrained riparian areas we selected for netting. The likelihood of detecting this bat acoustically is high if surveyed in large clearing and along the San Antonio River. This bat echolocates between 25-50 kHz.

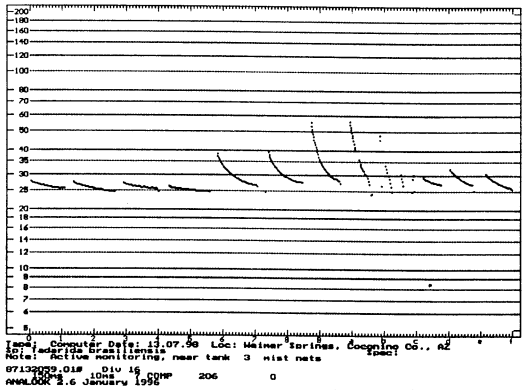


Figure 8. Sonogram of *Tadarida brasiliensis* calls.

The **evening bat** (*Nycticeius humeralis*) is a small bat that is found in the eastern half of Texas. Evening bats live in deciduous and coniferous forests, where they are most often found along waterways (Tuttle 2003). These bats mainly prey on beetles but other prey items include flying ants, spittlebugs, pomace flies, stinkbugs, and small moths (Tuttle 2003). These bats roost in tree cavities, behind loose bark and in bat houses. The likelihood of catching these bats is fairly good since all of the selected netting sites are along watercourses; however no evening bats have previously been recorded in the San Antonio area. The likelihood of detecting these bats acoustically is good. This bat echolocates at 34-50 kHz.

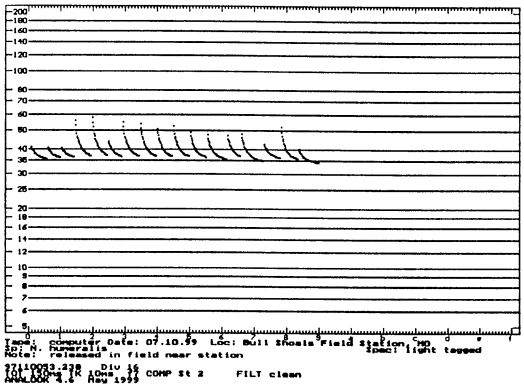


Figure 9. Sonogram of *Nycticeius humeralis* calls. Courtesy of Dr. Eric Britzke.

Site Evaluation — On 1 May 2002 Brett Carré, National Park Service Biologist for SAAN, met with Meg Goodman and Jim Kennedy for site familiarization and preliminary evaluation. Much discussion took place over the relative sterility of the majority of SAAN properties and general lack of suitable bat habitat. Most public-accessible sites at SAAN have manicured grounds (i.e. mowed grasses, pruned palm trees, etc.) and the historic structures have cracks and crevices sealed to prevent degradation from the elements. None of this is conducive to bat roosts. Brett was informed during that meeting that except for the occasional night-roosting bat, the only bat activity in those sites would probably be flyovers by commuting or foraging bats, which would not be capturable do to the open nature of the habitat. The many structures inspected during this initial assessment of all of the mission sites supported that contention, as no bats were noted and only an occasional bat dropping on the floor of some buildings was discovered, and that only with careful examination. This suggests that random use of buildings as night-roosts does occur, but no permanent roosts.

During the initial site visit it was noted that the riparian woodlot with no public access off Sierra Road (Zone 1), the riparian areas near Padre Park (Zone 2), Espada Park and Acequia Park (Zone 3), Espada Aqueduct and Mission San Juan nature trail (Zone 4), and Rancho de las Cabras (Zone 6) appeared to be better habitat than elsewhere on SAAN sites due to the presence

of mature hardwoods with potential roosts (hollows, sloughing bark, lightning scars, and weather damage), and were targeted for intense sampling via mistnetting and harp trapping. The best of these appeared to be the nature trail area behind Mission San Juan (Zone 4) and Rancho de las Cabras near Floresville (Zone 6). Many other sites appeared to be good foraging areas or commuting corridors, such as the San Antonio River corridor, Espada Dam, all acequias, and several of the overgrown fields near the San Antonio River. However, these were much more open and hence almost impossible to sample with current capture techniques such as netting and trapping. Figure 9 shows generalized indications of best potential bat roosting and foraging areas within SAAN.

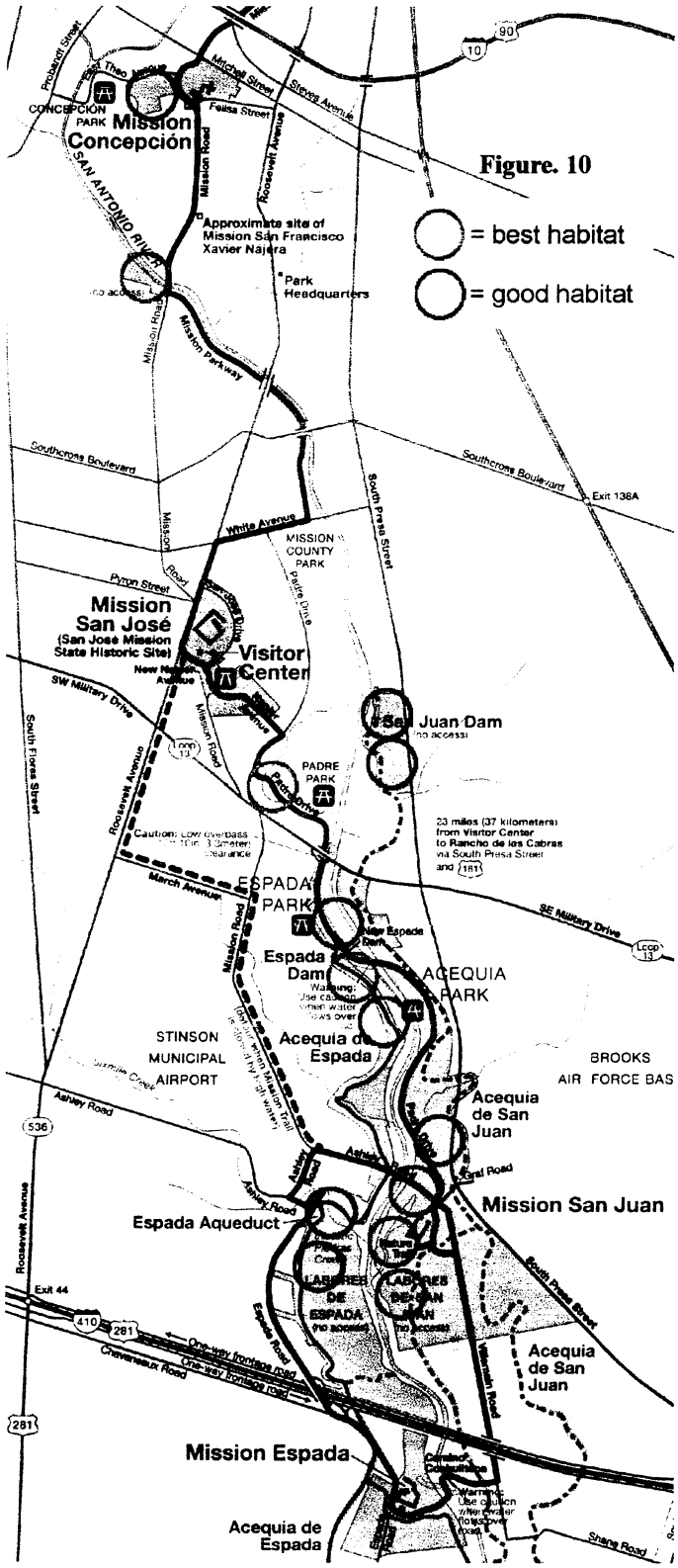


Figure. 10

Since most SAAN areas are open making foraging bats difficult to capture, a program was developed with the Alamo Area Chapter of the Master Naturalists to gather acoustic activity information to identify possible bat "hot spots". The data gathered (bat echolocation calls and feeding buzzes) does not distinguish between species or individual bats, but does provide an overall comparative level of abundance, identifying key areas for future work using more sophisticated identification systems. Simple data collection forms and a survey protocol were developed and distributed to the group after two training sessions by BCI biologists, 27 July and 14 August 2002 (Appendix 2). Master naturalists were instructed to survey all areas of SAAN on their own time, 30 minutes before sundown until any time throughout the evening, recording the number of bat calls and feeding buzzes every 30 minutes.

RESULTS

Site visits and results are summarized below. All capture data is combined in Table 3.

Day Roost Surveys —

1 May 2002. Meg Goodman, Jim Kennedy, Brett Carré. All of the public mission buildings at SAAN were visited to look for bat sign (guano and/or roost stains). As previously mentioned, little bat sign was

observed at the mission buildings. Mission sites were evaluated for the best potential sites for intense survey via mistnetting and harp-trapping.

7 June 2002. Jim Kennedy, Julia Germany. Many mission buildings at SAAN were revisited to look for additional bat sign (guano and/or roost stains) and re-evaluate that habitat for further work. A visit to one of the bell towers (at Mission San José) was scheduled, but cancelled due to Park safety concerns. Afterwards, the Rancho de las Cabras site was extensively hiked for orientation and potential roost evaluation. Future netting sites were identified, and acoustic surveys performed. Despite suitable weather and abundant insect activity, not a single bat call was detected near the old quarry.

Evening Bat Capture Surveys —
21 July 2002. Zone 2. Meg Goodman, Jim Kennedy, Kim Hoskins, Tammy Ash. Mistnetting efforts began in Padre Park at the northern Padre Drive crossing of an unnamed tributary to the San Antonio River. Two 18-foot nets were erected over the water, one east of Padre Drive, and the other west. Two lactating female evening bats were caught between 2115 and 2125 hours in the east net. This leads us to believe that a small maternity roost is in the immediate area. No other bats were detected the rest of the evening and netting efforts were concluded around 2300 hours.

27 July 2002. Zone 2. Meg Goodman, Jim Kennedy, Dr. John Bowles, Julie Jenkins, Anton Hajek, David Gates. The next mistnetting effort was at the southern Padre Drive crossing of the unnamed tributary. Two mistnets were erected on the east side of Padre Drive near the footbridge, one 40-foot net and another 18-foot net further to the east. Mist nets were open between the hours of 2000 and 2200. Many bats were detected foraging in the fields near the site with bat detectors, but no bats were heard by the footbridge or captured.

4 August 2002. Zone 5. Meg Goodman, Dr. John Bowles, Kirby Carroll, Charlie Camaro, Holly Camaro, Brett Carré, Anton Hajek. Three mistnets were erected along the Mission San Juan nature trail: one 30-foot over the old San Antonio River channel, one 18-foot and one 30-foot over the nature trail itself. The nets were open between the hours of 2100 and 2400. Two bats were captured in the net over the water at 2300 hours, one female Eastern red bat and one evening bat (sex undetermined). The evening bats escaped as it was being removed from the mistnet. Photographs and tissue samples were taken.

Figure 11. *Lasiurus borealis* from 4 August 2002, showing wing punch. Photo by Brett Carré, NPS.

17 August 2002. Zone 5. Meg Goodman, Jim Kennedy, Dr. Allyson Walsh, Dr. John Bowles, Faith Watkins, Kirby Carroll, Tammy Ash, Anton Hajek. This mistnetting effort proved to be highly successful as we increased field assistants as well as capture methods. Four mistnets were erected along the old San Antonio River channel, all 30 feet in length, and two harp-traps were set up along the nature trail itself. All traps and nets were open between the hours of 2000 and 2400. Two of the nets over the water proved successful with four Northern yellow bats, all males, and four evening bats, mostly females, captured throughout the evening. One evening bat

Figure 12. ***Lasiurus intermedius*** **from 17 August 2002. Photo by Faith Watkins, BCI.**

Figure 13. ***Nycticeius humeralis*** **from 17 August 2002. Photo by Faith Watkins, BCI.**

was also captured in one of the harp traps over the trail. Photographs and wing punches were taken of one northern yellow bat and one evening bat.

25 August 2002. Zone 6. Meg Goodman, Jim Kennedy, Dr. John Bowles, Julia Germany, Carrie Robertson. The final mistnetting effort for the month of August was conducted at Rancho de las Cabras, at Picosa Creek near its confluence with the San Antonio River. One 18-foot mistnet was erected over Picosa Creek. Two others, one 30-foot and one 42-foot, were erected near the intersection of the second side-drainage and Picosa Creek. Two harp traps were set up approximately 150 feet up each of the first two side-drainages. All traps and nets were open between the hours of 2000 and 2300. No bats were captured nor were any heard on the two bat detectors throughout the evening.

6 September 2002. Zone 3. Meg Goodman, Jim Kennedy, Dr. John Bowles, Carrie Robertson, Dr. Paul Robertson, Laura Rielly, Kirby Carroll, Jane Whitaker, Bernice Gonzales. This survey was conducted in Espada Park at the old Espada Dam. Two 42-foot nets were set at the old Espada Dam and five 18-foot nets were set downstream between the Old Dam and the San Antonio River. One of these nets was destroyed by a Great Blue Heron that flew through the net and consequently was not used in the survey. All remaining nets were open between the hours of 2000 and 2300. No bats were captured at this site but many were heard foraging over the San Antonio River channel by the New Espada Dam. These bats would have been impossible to catch as they were flying out in the open.

14 September 2002. Zone 4. Meg Goodman, Dr. Allyson Walsh, Kirby Carroll, Dr. John Bowles, Dana Price, Liam Hulbert. This mistnetting effort was conducted along the nature trail at Mission San Juan. Two 30-foot nets were erected along the old San Antonio River channel in two of the same places as previous visits, and one 8-foot net was placed over the nature trail. The nets were open between the hours of 2000 and 2300. One evening bat of unknown sex was captured.

At least two other mist netting dates were scheduled for October 2002, both of which were cancelled due to bad weather. Even the rain dates were cancelled due to continuing bad weather.

20 May 2003. Zone 4. Meg Goodman, Jim Kennedy, Faith Watkins, Dan Steed. This mistnetting

effort was accompanied by acoustic surveys which are discussed in the next section. One 18-foot mistnet was erected across the stream channel at Espada Aqueduct. No bats were captured.

In summary, 8 nights were spent mistnetting in 5 different zones within the park. Additional nights were scheduled but cancelled due to unsuitable weather conditions. Netting and harp-trapping sites were chosen to reflect our estimate of the highest probability of capturing bats and ease of access. No surveys were conducted in Zone 1 or at the Mission San Jose in Zone 2 due to the unsuitability of habitat for setting nets/traps and hence the low probability of capturing bats at either site. Survey attempts were not made at Espada Aqueduct in 2002 due to safety issues. However, with increased safety measures the site was able to be surveyed in 2003.

Acoustic Bat Surveys — Bat Activity Surveys

As mentioned previously, the lack of suitable roosts in SAAN properties means that most bats using the Park would be either just foraging or simply passing through. To aid in future site management, we felt that having additional data on bat activity areas, or "hot spots", would be most beneficial. This information would also help focus future acoustic research, if any. To these ends, we enlisted the Alamo Area Chapter of the Master Naturalist group to gather bat activity data from simple bat detector monitoring. This data is summarized below in Table 4. Caution should be exercised in interpreting this data, as 30 calls could mean 30 bats each calling once as easily as a single bat calling 30 times. However, it is very useful as a relative guide to bat activity in different parts of the Park. No further attempts were made to analyze this acoustic data.

In summary, 14 different acoustic monitoring efforts were made at 4 different sites on 14 nights. Most areas surveyed were in areas in which we did not mist net. These results demonstrated the high variability of bat activity from night to night and between zones across the park, but indicate that Mission San Juan consistently had relatively high bat activity. This supports our earlier habitat assessments.

In addition to these acoustic surveys, bat detectors were always turned on while mistnetting. By listening to the bat detector we could determine if bats were in the area or if they had hit the nets. If several people were present, some would survey acoustically in the open areas around the survey area. Many bats were detected in the open fields around the missions and especially over the main channel of the San Antonio River. However, no bats were detected at all on both netting nights at Ranchas de las Cabras. We found this to be surprising because based on the habitat we predicted this site might have some of the highest bat activity at SAAN. A subsequent acoustic (Anabat) survey recorded numerous calls (see below).

Acoustic Bat Surveys — Bat Identification Surveys

As a follow-up to the field work in 2002, the Principal Investigators agreed to visit SAAN 3 more times in 2003, to attempt recording bat calls for future species identification in sites impossible to mistnet. These surveys were not part of the original Work Plan or agreement with SAAN and Los Compadres. However, we felt that additional acoustic monitoring would hopefully add more of the targeted bat species to the current list known from the Park. The equipment and software (Anabat, Titley Electronics, Ballina NSW, Australia, http://www.titley.com.au) was selected primarily because of its availability and familiarity to the investigators, not from any inherent superiority over other acoustic bat detection packages. To explain simply, mathematical parameters of individual calls (slope, duration, maximum frequency, etc.) are measured and compared to a "library" of known bat calls. Individual species

Table 3. Capture Results by Zone through June 2003[1]

ZONE 1

No surveys were conducted in Zone 1 due to the poor habitat and low probability of capturing bats in this area.

ZONE 2

Both surveys were conducted over unnamed tributaries that crossed Padre Drive.

GPS location	Date	Species	Sex	Age	Reproductive Status	Comments
N551129 E3247164	21 July 2002	2 evening bats	2 females	2 adults	both lactating	Could be a roost site nearby; this is a new record for Bexar County
N551314 E3247087	27 July 2002	no bats captured	n/a	n/a	n/a	none

ZONE 3

This survey was conducted at Espada Park at the Old Espada Dam and the tributary downstream of the dam.

GPS location	Date	Species	Sex	Age	Reproductive Status	Comments
N551930 E3246245	6 Sept. 2002	no bats captured	n/a	n/a	n/a	none

ZONE 4

Surveys were conducted along the nature trail at Mission San Juan.

GPS location	Date	Species	Sex	Age	Reproductive Status	Comments
N552805 E3244694	4 Aug. 2002	1 evening bat	n/a	n/a	n/a	Bat escaped from the mistnet
N552805 E3244694	4 Aug. 2002	1 Red Bat	female	juvenile	non-reproductive	Wing punch taken
N552805 E3244694	17 Aug. 2002	2 evening bats	n/a	n/a	n/a	Bats escaped from the mistnet
N552805 E3244694	17 Aug. 2002	2 evening bats	2 females	2 juveniles	2 non-reproductive	Wing punch taken from one
N552805 E3244694	17 Aug. 2002	1 evening bat	1 male	1 juvenile	n/a	This bat was caught in the harp trap along the nature trail.
N552805 E3244694	17 Aug. 2002	2 N. yellow bats	2 males	2 adults	n/a	Wing punch was taken from one of the bats
N552805 E3244694	17 Aug. 2002	2 N. yellow bats	2 males	2 juveniles	n/a	n/a
N552805 E3244694	14 Sept. 2002	1 evening Bat	n/a	n/a	n/a	This bat escaped from the mistnet.

ZONE 5

This survey was conducted along the stream channel at the Espada Aqueduct.

GPS location	Date	Species	Sex	Age	Reproductive Status	Comments
N552329 E3244778	20 May 2003	no bats captured	n/a	n/a	n/a	Few bat calls recorded

ZONE 6

Surveys were conducted along Picosa Creek near the intersection with the San Antonio River.

GPS location	Date	Species	Sex	Age	Reproductive Status	Comments
N587749 E3214607	25 Aug. 2002	no bats captured	n/a	n/a	n/a	n/a

[1] All coordinates are UTM, NAD27 CONUS.

Table 4. Acoustic Monitoring Results (Activity Level) through June 2003

ZONE 1

Mission Concepción	2 August 2002	7 August 2002	15 August 2002	29 August 2002
Average bat calls per ½ hour	40	91	9	9
Average feeding buzzes per ½ hour	19	47	1	20

ZONE 2

Mission San José	1 August 2002	22 August 2002	19 Sept 2002	22 October 2002
Average bat calls per ½ hour	5	0	8	16
Average feeding buzzes per ½ hour	0		1	1
Padre Park				
Average bat calls per ½ hour	-	95	-	-
Average feeding buzzes per ½ hour	-	6	-	-

ZONE 3

No acoustic surveys done by Master Naturalists within Zone 3

ZONE 4

Mission San Juan	4 August 2002	8 August 2002	17 August 2002	26 Sept. 2002
Average bat calls per ½ hour	59	19	27	17
Average feeding buzzes per ½ hour	28	3	9	4

Zone 5

Mission Espada	21 August 2002	5 Sept. 2002
Average bat calls per ½ hour	21	25
Average feeding buzzes per ½ hour	7	5

Zone 6

No acoustic surveys done by Master Naturalists within Zone 6 due to access issues.

may have many calls, and calls may vary regionally, by sex and reproductive status, and in differing habitat types. Many species have "cryptic" calls, unable to differentiate outside of a small group of species. However, the target bat species at SAAN should have sufficiently distinct calls so as to be able to identify them by species provided a good call sequence was recorded. A copy of all raw Anabat recordings made on the following dates are provided on a disk with this report. Analysis and positive identification of these calls have not yet been completed.

20 May 2003. Meg Goodman, Jim Kennedy, Faith Watkins, Dan Steed. Zone 4 An Anabat acoustic bat detector was set up along the channel at Espada Aqueduct from 2030 and 2210 hours. Few calls (7) were heard and recorded, but none was of sufficient quality to determine species.

28 May 2003. Meg Goodman, Jim Kennedy. Zone 3. An Anabat acoustic bat detector was set up along the San Antonio River at the New Espada Dam from 2000 to 2200 hours. Many bats were seen and heard, but few (10) good call sequences were recorded. Only *Lasiurus borealis* could be positively identified, although it is highly likely other species were also present.

18 June 2003. Meg Goodman, Jim Kennedy. Zone 6. An Anabat acoustic bat detector was set up along the San Antonio River at Ranchos de los Cabras from 2000 to 2200 hours. Many bat observations were made, and many good call sequences were recorded (154 files). Of these, we were able to positively identify *Nycticeius humeralis, Lasiurus borealis, Lasiurus cinereus, and*

Tadarida brasiliensis. All but *L. borealis* are new records for Wilson County. These bats were flying over and feeding and drinking at the large open river channel at the southeastern boundary of the parcel. They would have been extremely difficult to capture, if at all, due to the openness of the area, the deep water, the steep, muddy banks, and the sheer areal extent of the river. It is possible that additional species, including *Pipistrellus subflavus* and *Myotis velifer* were also present, but undetected.

The principle investigators are deeply indebted to Dr. Eric Britzke of the Department of Forestry and Natural Resources at Clemson University for the analysis of the 171 files recorded during this phase of the project.

DISCUSSION AND RECOMMENDATIONS

Inventory completeness — Surveys positively identified 3 of the 7 potential species for Bexar and Wilson counties: Eastern red bat, evening bat, and Northern yellow bat. It is not surprising that the hoary bat was not captured, as previous records indicate that the bat may not be present except for spring and fall migrations. Similarly, the Mexican free-tailed bat was unlikely to be caught in the relatively cluttered mistnetting sites available, since it is generally a species that forages high up and lacks the maneuverability to drink from cluttered waterways. Further acoustic (Anabat) surveys in 2003 documented 4 species in the more open areas of Espada Dam and Rancho de las Cabras. Two other bat species we expected to record in SAAN were not captured or recorded acoustically: cave myotis and Eastern pipistrelle. We believe these bats are likely using SAAN as a foraging and /or commuting area and could be detected using more sophisticated acoustic survey methods.

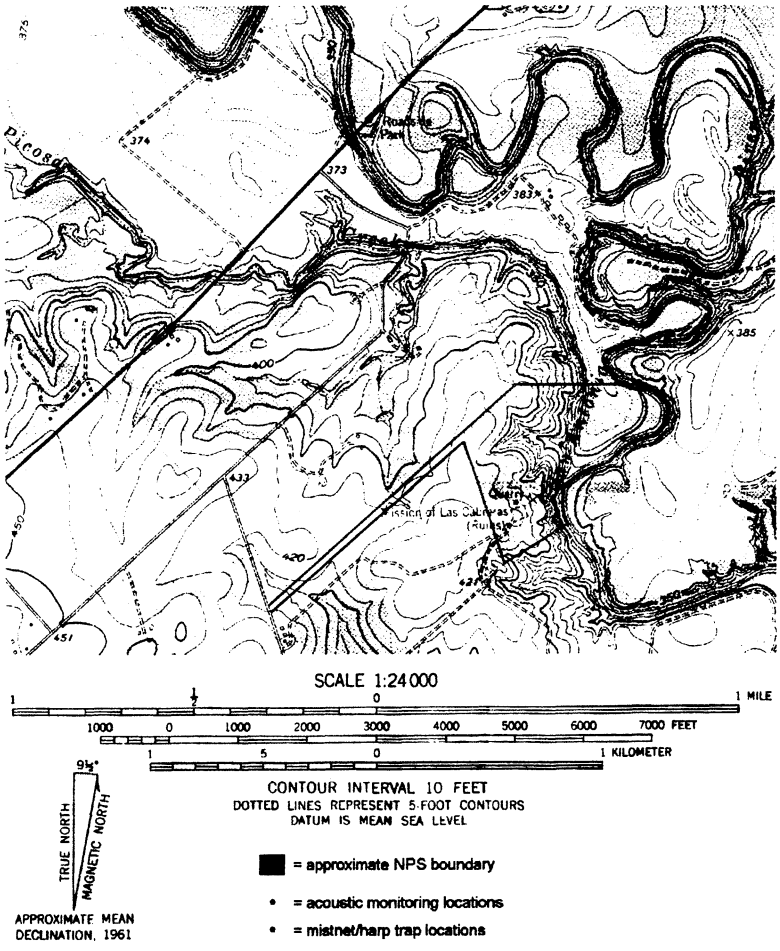


Figure 14. Rancho de las Cabras, Wilson County, showing acoustic survey and trapping locations.

Bats are notably among the more difficult animals to sample and there is a growing recognition of these difficulties (Hayes 2000, O'Shea and Bogan 1999). Only one study conducted in North America has attempted to determine survey effort required to characterize a bat species assemblage in a forest in the Pacific Southwest. This is not yet published (Weller and Zabel 2001).

In this study, bats were sampled using mistnets at sites across a watershed for five years. Annual species assemblages were captured after 6-19 nights of effort, and it took 6-11 nights per year to capture the six most common species in the watershed. Capture effort was reduced slightly by eliminating efforts prior to the capture of the first juvenile and sampling four productive sites repeatedly was more efficient than sampling additional sites. We carried out 7 nights mistnetting, starting surveys when juveniles were likely to be on the wing and focusing survey efforts on the more productive sites. This falls above the minimum sampling effort indicated in the available literature. However, the low and variable use of the park by bats as revealed by our results suggests that a higher sampling effort is required to complete the bat inventory. While several additional surveyed evenings were scheduled, the logistics of arranging for groups of people to travel from Austin to carry out bat surveys for this project were hampered by the frequent need to cancel field operations due to unsuitable survey weather conditions.

Bat Management Recommendations — As previously noted, properties at SAAN offer little in the way of good-quality roost sites. Bats primarily either pass through the Park on their way elsewhere, or feed over the open riparian areas.

In order to improve roost availability, we recommend creating more natural roosting sites for bats in the wooded areas of the park by leaving mature trees, old snags and hollows, and other senescent trees in place, in addition to managing for future roost tree recruitment.

Another management technique is the addition of artificial roosts in the form of bat houses. In many areas where natural roosts are no longer abundant, bat houses can be critical to the long-term health of local bat populations. Bat Conservation International has a long-term research project (since 1993) to study the effects of various bat house designs, placements, and other variables. Results are summarized in our resource publication, *The Bat House Builder's Handbook*, which is attached to this report (Appendix 3). BCI's North American Bat House Research Project coordinators are happy to assist SAAN in a trial bat house project in areas of the Park not currently open to the public. The best area that we identified for clusters of bat houses is the old park east and south of the San Juan Dam ("State Hospital grounds"), north of Military Drive.

Bat houses also make ideal interpretive displays, giving people a closer look at an elusive animal, and involving them in wildlife conservation in their communities. However, unrestricted access to bat houses in many areas of the Park may allow bats and bat houses to be vandalized either through fear or ignorance.

Since the bats use the waterways nightly as a source of water and foraging area, we recommend that SAAN continue to maintain and improve water quality for bats. This includes maintaining open and clean waterways, clean up of old tires and other debris, flood control, and future streambank and vegetation management.

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Appendix 1: Data Sheets

Appendix 2: Acoustic activity level monitoring protocols for volunteers.

Appendix 3: *The Bat House Builder's Handbook*

Also submitted with this report: tissue samples from captured species.

Appendix 1:

Copies of completed Project data forms.

BAT CAPTURE DATA FORM

Meg, Jim, Tammy, Ash & Kim Hoskins, Goodman, Kennedy

Location (state, nearest town, area): [illegible] F [illegible]

Date: 7/21/02 Start Time: 9:05 pm End Time: 10:45 Recorder(s): Kim Hoskins

Moon Phase: ______ Start Temp: 85.6 End Temp: 83.0 %Cloud Cover: 10%

Habitat Description: Urban stream Capture Technique (# and size of nets/traps): 2 18' mist nets

Set Over/Near Water? (YES) NO — If "YES" dimensions of Pool-Size: ____W x ____ L and of Swoop-Zone: ____ W x ____L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
9:15	Evening Nycticeius	F	A	L	36	12	9½
9:25	Evening " "	F	A	L	37	14	9½

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK (YES) NO NOTES ON BACK (YES) NO PAGE: 1 OF: ____

& a bit breezy+ 14R

BAT CAPTURE DATA FORM

Location (state, nearest town, area): TX, San Antonio, Espada Dam

Date: July 27, 2002 Start Time: 8:30 pm End Time: 9:45 pm Recorder(s): David Gale, Jim, Julie, Meg Goodwin, Dr. John Bowe, Anton

Moon Phase: ______ Start Temp: 84.8°F End Temp: 82.6 %Cloud Cover: 20%

Habitat Description: Urban, Riparian Capture Technique (# and size of nets/traps): #1 - 90' under bridge; #2 - 18' 20'

Set Over/Near Water? (YES circled) NO — If "YES" dimensions of Pool-Size: 90 W x Stream L and of Swoop-Zone: ____ W x ____ L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
	NO BATS						

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK YES NO NOTES ON BACK YES NO PAGE: ______ OF: ______

BAT CAPTURE DATA FORM

Location (state, nearest town, area): Texas, San Antonio, San Juan Mission Nature trail

Date: 4 Aug 2002 Start Time: 2115 End Time: 2350 Recorder(s): Meg, Kirby, John, Brett, Chase, Anton, Holly

Moon Phase: _____ Start Temp: 83°F End Temp: 77°F %Cloud Cover: _____

Habitat Description: Urban aquatic Capture Technique (# and size of nets/traps): 3 nets

Set Over/Near Water? YES NO — If "YES" dimensions of Pool-Size: 30 W x _____ L and of Swoop-Zone: _____ W x _____ L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
2300	LASBOR	F	~~A~~ J	NR	42mm	12 MM	11g
2300	Evening Bat - MYL						

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK YES NO NOTES ON BACK YES NO PAGE: _____ OF: _____

Net 3

BAT CAPTURE DATA FORM

Location (state, nearest town, area): Texas - SA - Mission San Juan - nature trail

Date: 8/17 Start Time: 2030 End Time: 2330 Recorder(s): MEG, AL, FAITH, JIM, KIRBY, ANNA

Moon Phase: 1/2 MOON Start Temp: 80°F End Temp: 80°F %Cloud Cover: 0%

Habitat Description: URBAN RIPARIAN Capture Technique (# and size of nets/traps): PICTURE ON FORM 1

Set Over/Near Water? YES NO — If "YES" dimensions of Pool-Size: ____ W x ____ L and of Swoop-Zone: ____ W x ____ L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (R) (MM)	EAR (MM)	Weight (G)
~~2119~~ ~~#15~~	WING PUNCH) Lasiurus ~~ega~~ - Net 3	M	A	N/A	53.0	~~19.0~~ 15.0	22.5 - 1.5 = 21.0
	N. humeralis - net 3	?	?	** Got away / of net	N/A	N/A	N/A
2119	~~Las~~ LAEG LASINT Net 3	M	A	N/A	54	13	24.5
			14	0552765 / 3244672			

13.5

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK YES NO NOTES ON BACK YES NO PAGE: ____ OF: ____

BAT CAPTURE DATA FORM

Location (state, nearest town, area): Mission San Juan - Nature Trail Texas - San Antonio

Date: 1st AUG 2002 Start Time: 2030 End Time: 2330 Recorder(s): MEG, AL, FAITH, JIM, KIRBY, TAMMY

Moon Phase: 1/2 MOON Start Temp: 86°F End Temp: 80°F %Cloud Cover: 20%

Habitat Description: URBAN RIPARIAN Capture Technique (# and size of nets/traps): 4 Nets over water, 2 harp trap over trail

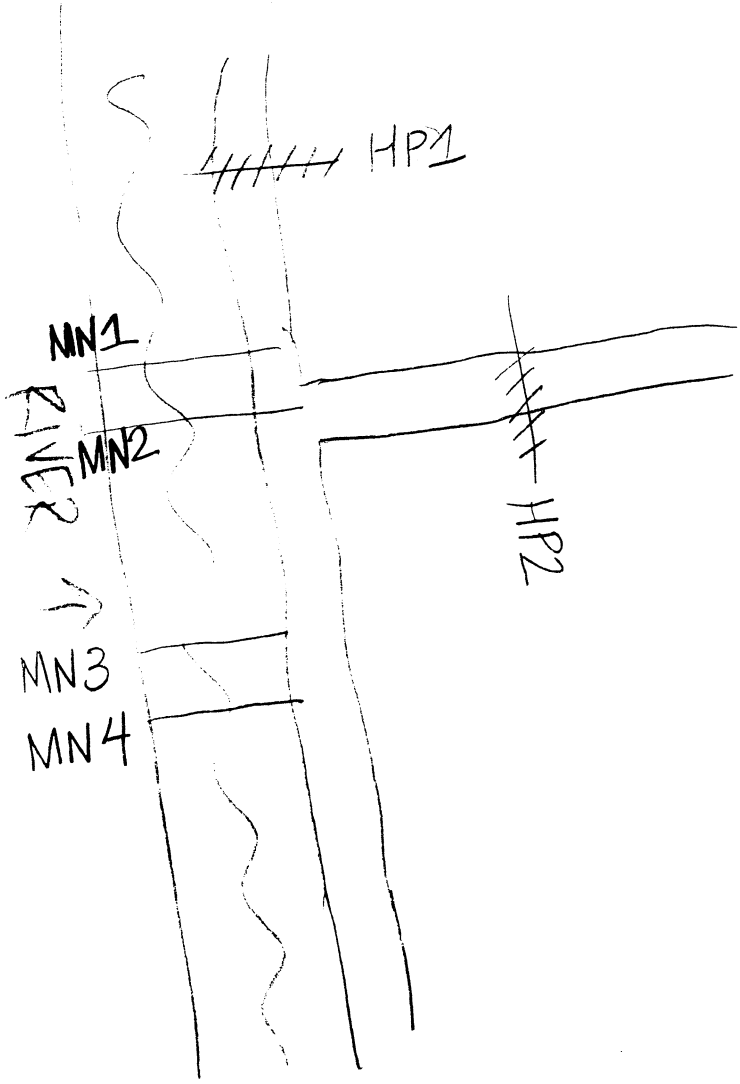
PICTURE ON BACK

Set Over/Near Water? YES NO — If "YES" dimensions of Pool-Size: ____ W x ____ L and of Swoop-Zone: ____ W x ____ L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
	(1 wing punch)						
2100	NYCHUM NET 3	F	J	NR	38mm	10 mm	10.5 g
2105	LASINT NET 4	M	J	N/A	53 mm	15MM	22.0g
2115	LASINT NET 3	M	J	NR	55	15 mm	0
2145	NYCHUM HARP 2	M	J		33mm	12 mm	9.0g
2210	NYCHUM NET 4	F	J	NR	85mm	10 mm	10.5g
2215	NYCHUM NET 3	—	—	—	35MM	10MM	0
	NET #4		14	0552762/3244659			

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK (YES) NO NOTES ON BACK (YES) NO PAGE: ____ OF: ____


HP1
MN1
MN2
RIVER
MN3
MN4
HP2

BAT CAPTURE DATA FORM

lat N2905.833 NAD27
long W9809.862

Location (state, nearest town, area): Rancheas de las Cabras

Date: 25AUG2002 Start Time: 1830 End Time: _____ Recorder(s): Meg, Jim, Caeree, John & Julia

Moon Phase: full+3 Start Temp: 88°F End Temp: _____ %Cloud Cover: <5%

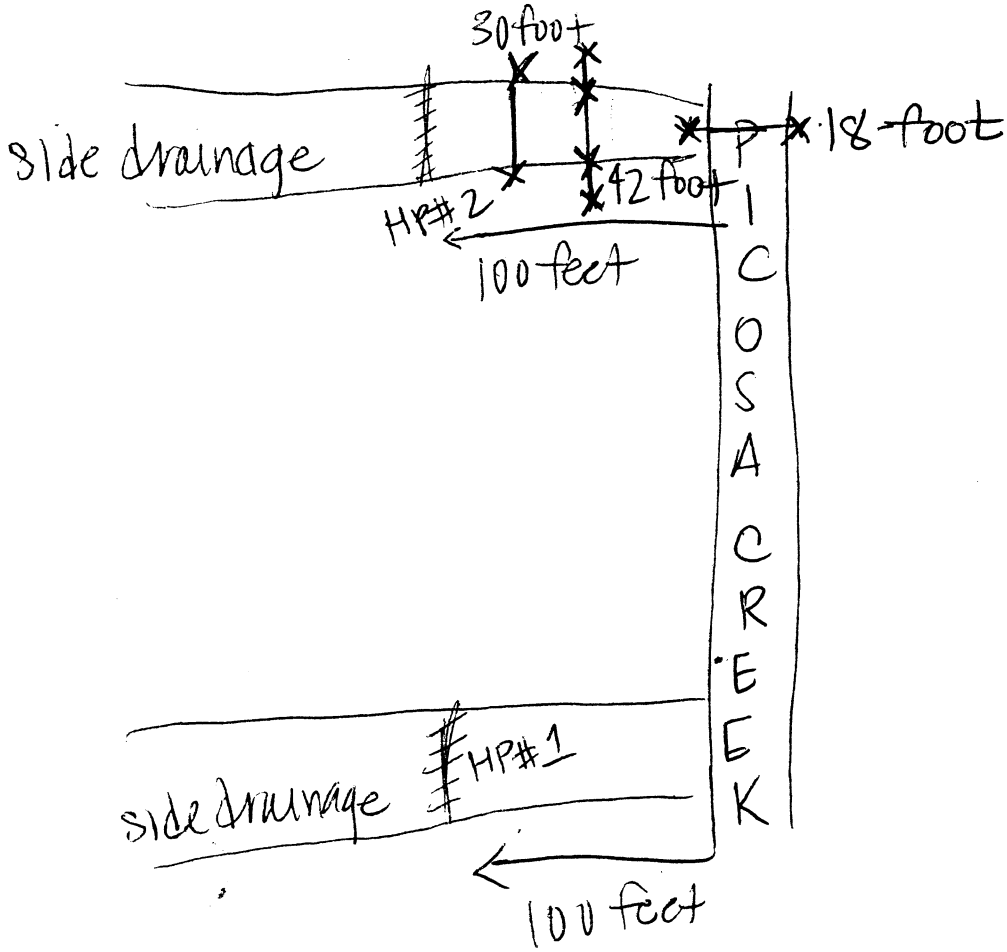
Habitat Description: bottomland hardwood on Picosa Creek - open understory, lots of flood digree Capture Technique (# and size of nets/traps): 3 nets, 2 harp traps

Set Over/Near Water? YES NO — If "YES" dimensions of Pool-Size: _____W x _____L and of Swoop-Zone: _____ W x _____L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
				NO BATS			
				captured or heard			

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK (YES) NO NOTES ON BACK (YES) NO PAGE: _____ OF: _____


30 foot
18 foot
side drainage
HP#2
42 foot
100 feet
PICOSA CREEK
side drainage
HP#1
100 feet

BAT CAPTURE DATA FORM

Location (state, nearest town, area): Texas, San Antonio, Espada Dam-Espada Park

Date: 6 September 2003 Start Time: ~~1600~~ 2000 End Time: ~~2300~~ 2500 Recorder(s): Meg, JIM, Laura, Paul, Cam e, Dr. John, Kirby, Jane, Bernic

Moon Phase: new Start Temp: 84.9°F End Temp: 79.5°F %Cloud Cover:

Habitat Description: urban riparian Capture Technique (# and size of nets/traps): 7 nets - picture on back

Set Over/Near Water? (YES) NO — If "YES" dimensions of Pool-Size: _____ W x _____ L and of Swoop-Zone: _____ W x _____ L (*put diagram on bac*

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)

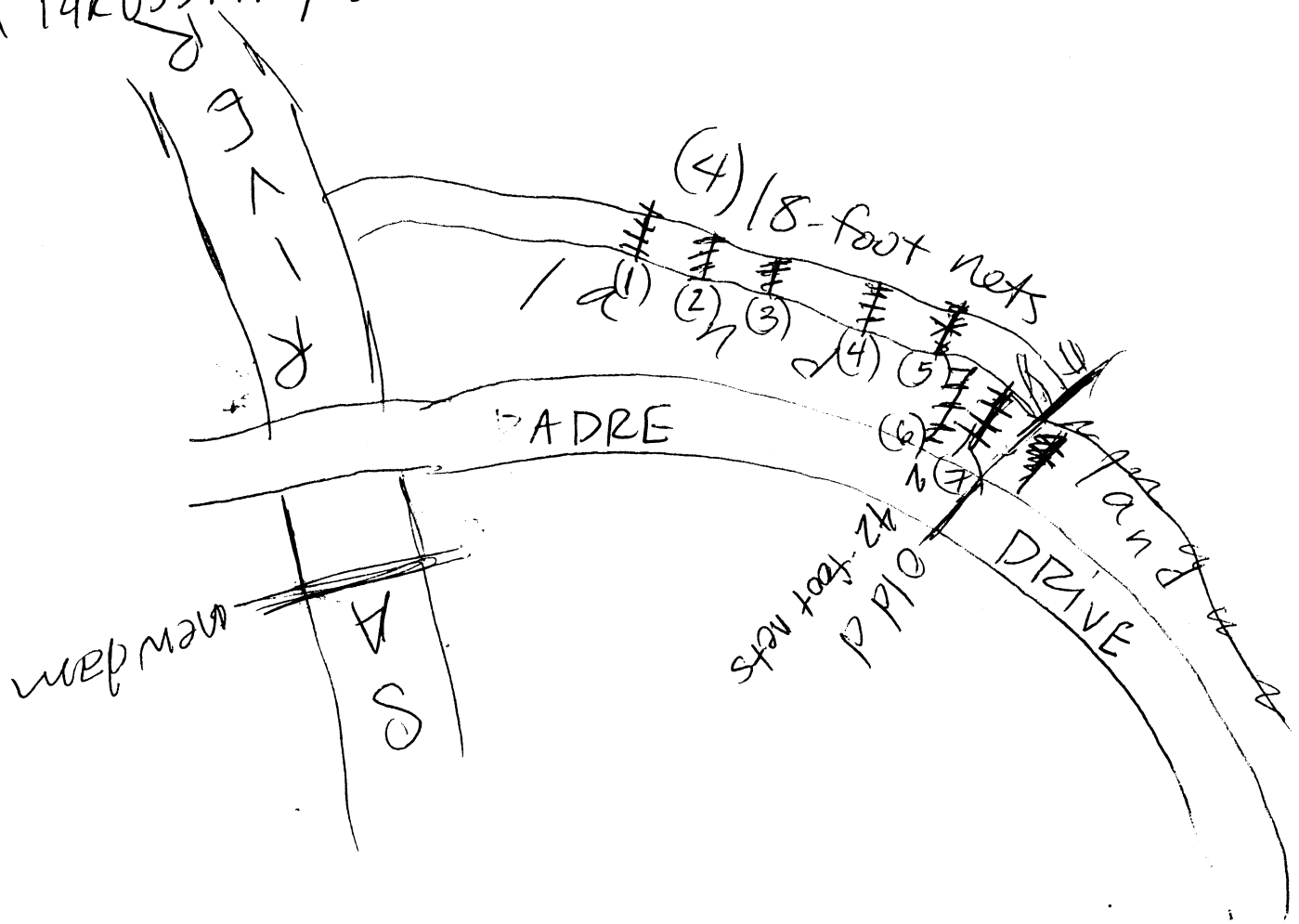
NO BATS

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK (YES) NO (circle one) NOTES ON BACK (YES) NO (circle one) PAGE: _____ OF: _____

Net 1: UTM 14R 0552009/3246217
net 2: UTM 14R 0552003/3246225
net 3: UTM 14R 0551991/3246228
net 4: UTM 14R 0551964/3246223

Net 5: UTM14R0551946/3246227
Net 6/7: UTM0551930/3246245



Collectors Name: Allyson & Tammy (Meg & Kirby)

Fur and Tissue Sampling Data Sheet

Field #1	Field #2	Field #3	Field #4	Field #5	Field #6	Field #7	Field #8	Field #9	Field #10	Field #11
Individual Identifier	Date	State/ Prov.	County	Locality	Species	Sex	Repro Cond.	Age	Hair Vial #	Tissue Taken
MG, KC	4 AUG 2002	TX	Bexar	San Juan Nature trail	Red Bat	F	NR	A		1/wing
all	17 AUG 2002	TX	Bexar	" " " "	NYCHUM	F	NR	J		1 right wing
all	17 AUG 2002	TX	"	" " " "	LASINT	M	N/A	A		1 right wing
					↳ (Sent to Dr. Bikam's lab (Dr. ~~Ha~~ Patton) @ TTU					

Fur and Tissue Sampling Data Sheet (back)

Identifier	Comments

BAT CAPTURE DATA FORM

Location (state, nearest town, area): Texas, San Antonio, San Juan Mission Nature Trail

Date: 14 Sept 2002 Start Time: 2000 End Time: 2300 Recorder(s): Meg, Allyson, Dr. John Dana, Liam & Kirby

Moon Phase: _____ Start Temp: _____ End Temp: _____ %Cloud Cover: _____

Habitat Description: urban riparian Capture Technique (# and size of nets/traps): 3 nets 2 30' over water 1 8' over trail

Set Over/Near Water? YES NO — If "YES" dimensions of Pool-Size: _____ W x _____ L and of Swoop-Zone: _____ W x _____ L (*put diagram on back*) see back

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
2130	NYCHUM	—	—	—	—	—	—

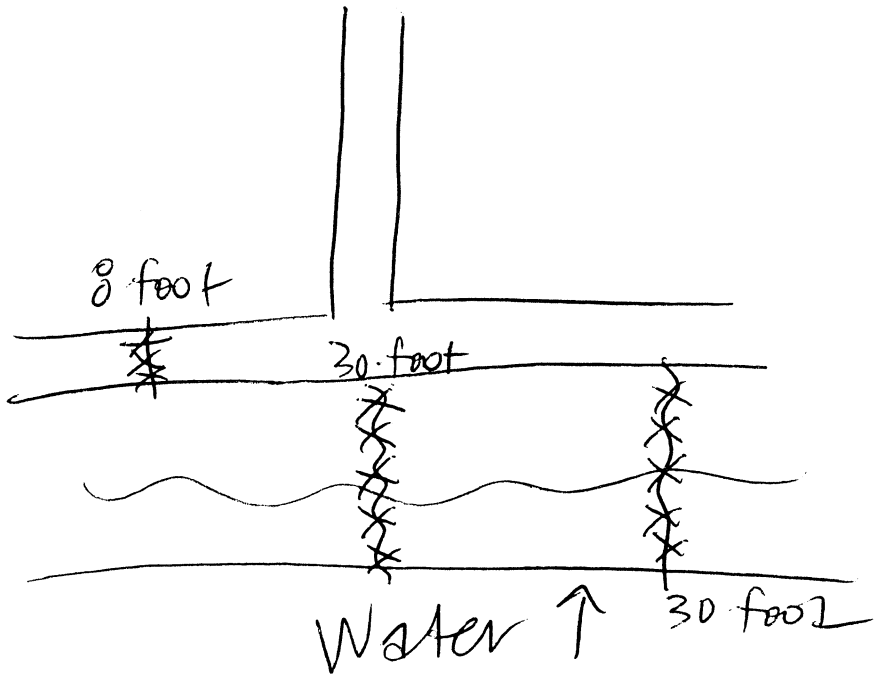
SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK YES NO (circle one)

NOTES ON BACK YES NO (circle one)

PAGE: _____ OF: _____

X Mission



BAT CAPTURE DATA FORM

GPS point: 0552330 3244775 Zone 14R NAD27

Location (state, nearest town, area): ESPADA AQUADUCT

Date: 20 May 2003 Start Time: 2030 End Time: 2210 Recorder(s): MEG, JIM, FAITH, DAN STEED

Moon Phase: _____ Start Temp: 80°F very T humidity End Temp: 75°F %Cloud Cover: 100%

Habitat Description: urban riparian Capture Technique (# and size of nets/traps): 1 18-foot net

Set Over/Near Water? (YES) NO — If "YES" dimensions of Pool-Size: 60' W x 40' L and of Swoop-Zone: ~~2~~ W x _____ L (*put diagram on back*)

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRODUCTIVE STATUS (P/L/PL/NR)	FA (MM)	EAR (MM)	Weight (G)
	NO BATS						

SEX: **M** (male) or **F** (female) AGE: **A** (adult) or **J** (juvenile) REPRO: **P** (pregnant), **L** (lactating), **PL** (post-lactating), or **NR** (non-repoductive)

DIAGRAM OF SET-UP ON BACK (YES) NO NOTES ON BACK (YES) NO PAGE: 1 OF: 1

10-foot

Post-it® Fax Note 7671	Date 9/2/02 # of pages ▶ 19
To Meg	From David Gates
Co./Dept.	Co.
Phone #	Phone #
Fax # 512-912-7058	Fax # 210-736-0825

Surveyor: David G

Date: 8/1/02

Assistant Surveyors:

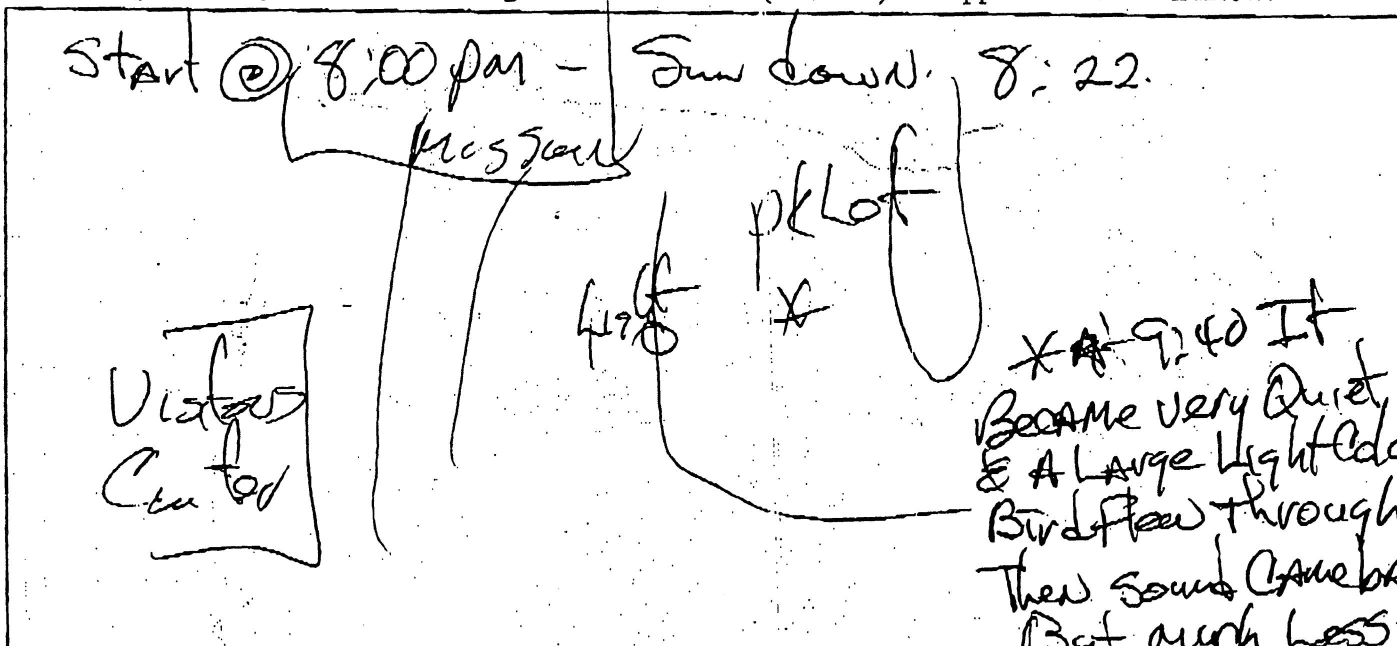
Partly Cloudy
Temp Less than 90°F

SURVEY LOCATION

SAAN Unit (see map on back): MISSION SAN JOSE

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz): "G" 32.5KHz

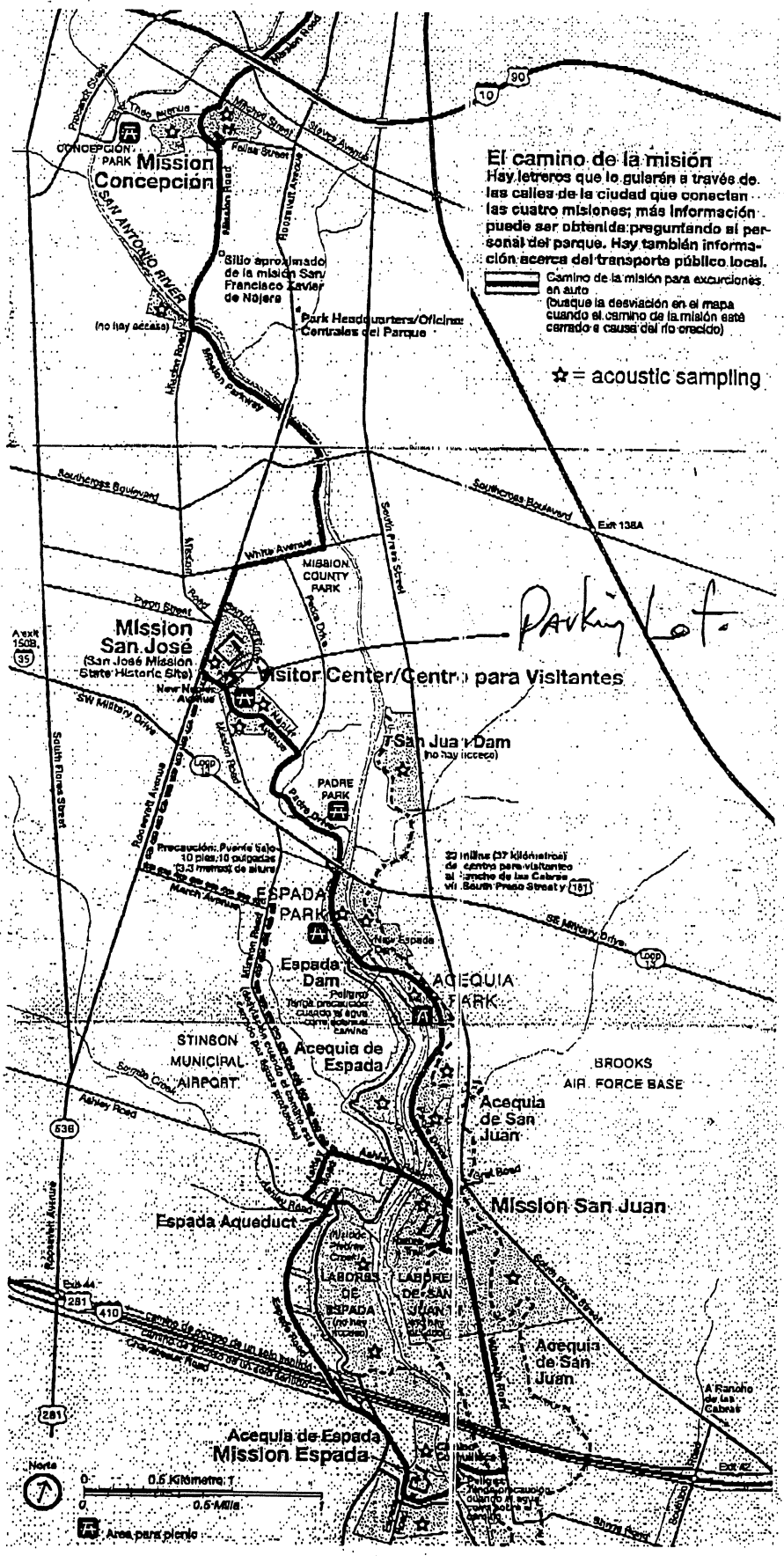
TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use ЖЖ tally)

Start 8:45

7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
	None	ЖЖ ЖЖ ЖЖ |||| ~~Constant~~	At 9:00 Sound still Constant	9:30 Constant some short Pauses			
	None	~~Impossible to count~~		*			

Open Survey only

8/1


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión está cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCION PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Road
Mission Parkway
Southcross Boulevard
Exit 138A
White Avenue
MISSION COUNTY PARK
Parking Lot
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
SW Military Drive
South Flores Street
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente bajo 10 pies, 10 pulgadas (3.3 metros) de altura
ESPADA PARK
Espada Dam
Peligro
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
Espada Aqueduct
Mission San Juan
LABORES DE ESPADA
(no hay acceso)
LABORE DE SAN JUAN
(no hay acceso)
Acequia de San Juan
A Rancho de las Cabras
Acequia de Espada
Mission Espada
Norte
0 0.5 Kilometro 1
0 0.5 Milla 1
Area para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: ANTON PAUL HAJEK III Date: 02 AUG 2002

Assistant Surveyors:

SURVEY LOCATION

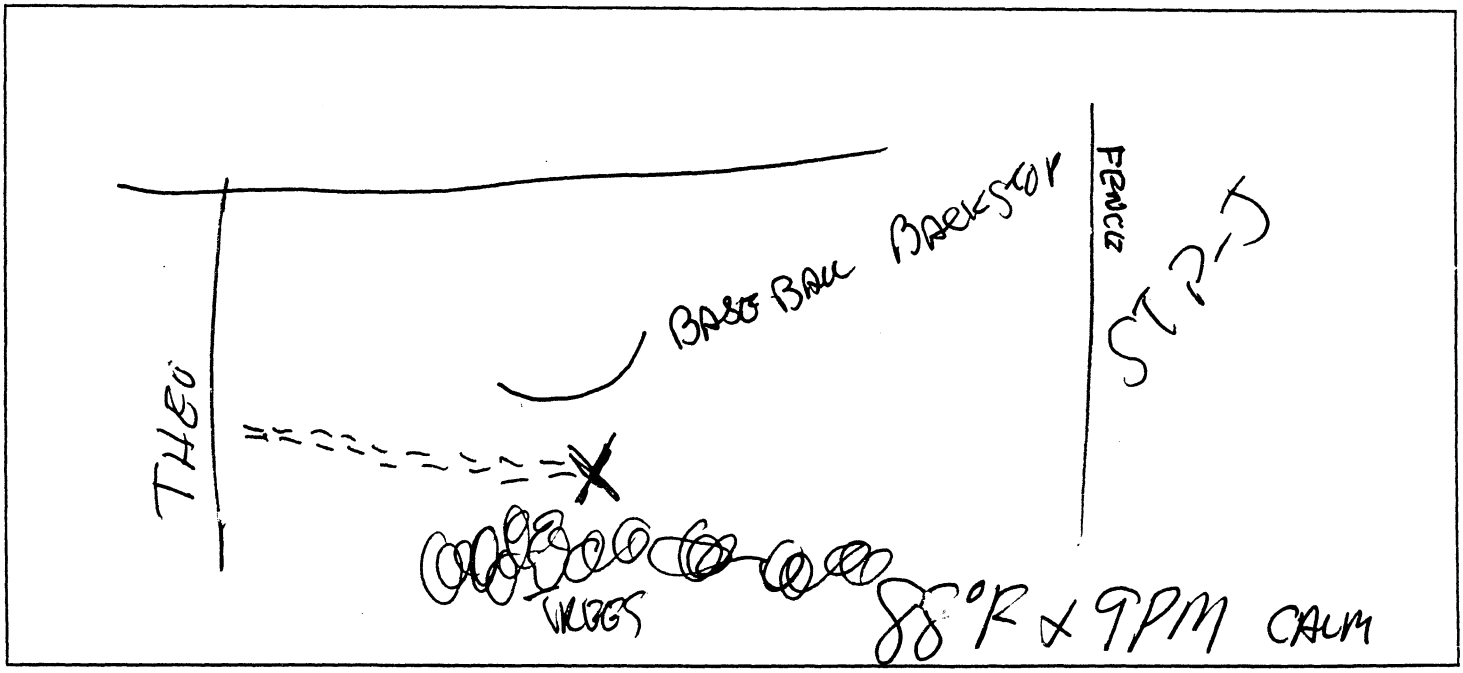
SAAN Unit (see map on back): MISSION CONCEPCION

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

H AT 35 kHz

E AT 60 KHz

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



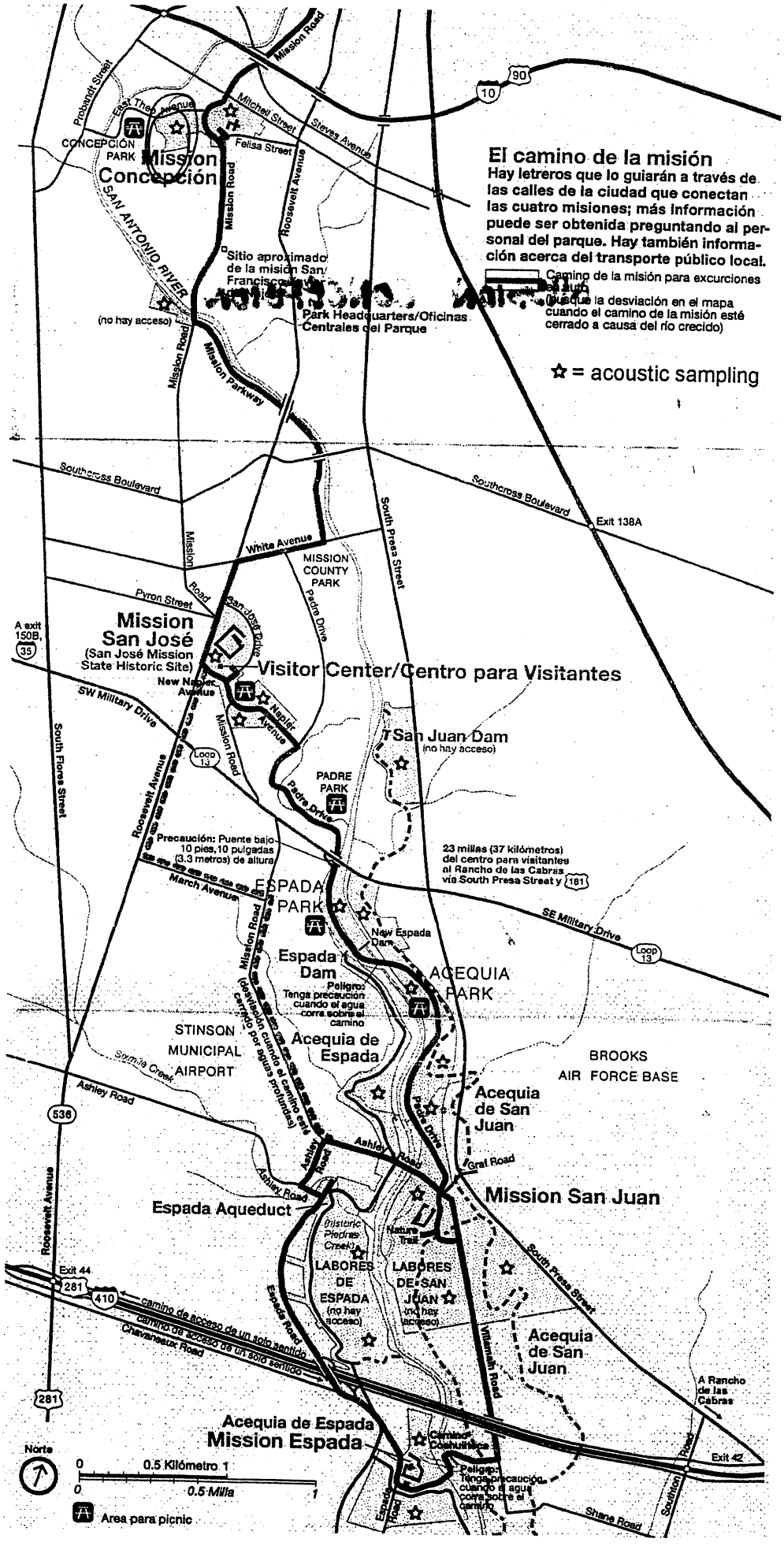
GPS coordinates (NAD 27): Zone: 14 Northing: 0549130 Easting: 3251133

Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use ~~𝍸~~ tally)

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls			17	92	13			
Buzzes			8	49				

1PM ONLY 12


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excurciones en auto
(Busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
CONCEPCIÓN PARK
Mission Concepción
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco
Park Headquarters/Oficinas Centrales del Parque
(no hay acceso)
Mission Road
Mission Parkway
Probandt Street
East Theo Avenue
Mitchell Street
Felisa Street
Steves Avenue
Roosevelt Avenue
Mission Road
90
10
Southcross Boulevard
Exit 138A
White Avenue
MISSION COUNTY PARK
Padre Drive
South Presa Street
Pyron Street
San José Drive
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
New Navarro Avenue
Napier Avenue
A exit 150B, 35
SW Military Drive
South Flores Street
Loop 13
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente bajo - 10 pies,10 pulgadas (3.3 metros) de altura
March Avenue
ESPADA PARK
23 millas (37 kilómetros) del centro para visitantes al Rancho de las Cabras via South Presa Street y 181
SE Military Drive
New Espada Dam
Espada Dam
Peligro: Tenga precaución cuando el agua corra sobre el camino
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
(destrucción cuando el Camino está cerrado por aguas profundas)
Salitrillo Creek
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
536
Graf Road
Mission San Juan
Espada Aqueduct
Historic Piedras Creek
Nature Trail
LABORES DE ESPADA (no hay acceso)
LABORES DE SAN JUAN (no hay acceso)
South Presa Street
Exit 44
281
410
camino de acceso de un solo sentido
Chavaneaux Road
Espada Road
Villamain Road
Acequia de San Juan
A Rancho de las Cabras
Acequia de Espada
Mission Espada
Camino Coahuilteco
Peligro: Tenga precaución cuando el agua corra sobre el camino
Exit 42
Shane Road
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Area para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: ANTON PAUL HAJEK III (MASTER NATURALISTS) Date: 04 AUG 2002

Assistant Surveyors: HOLLY CAMEZO

SURVEY LOCATION MISSION SAN JUAN

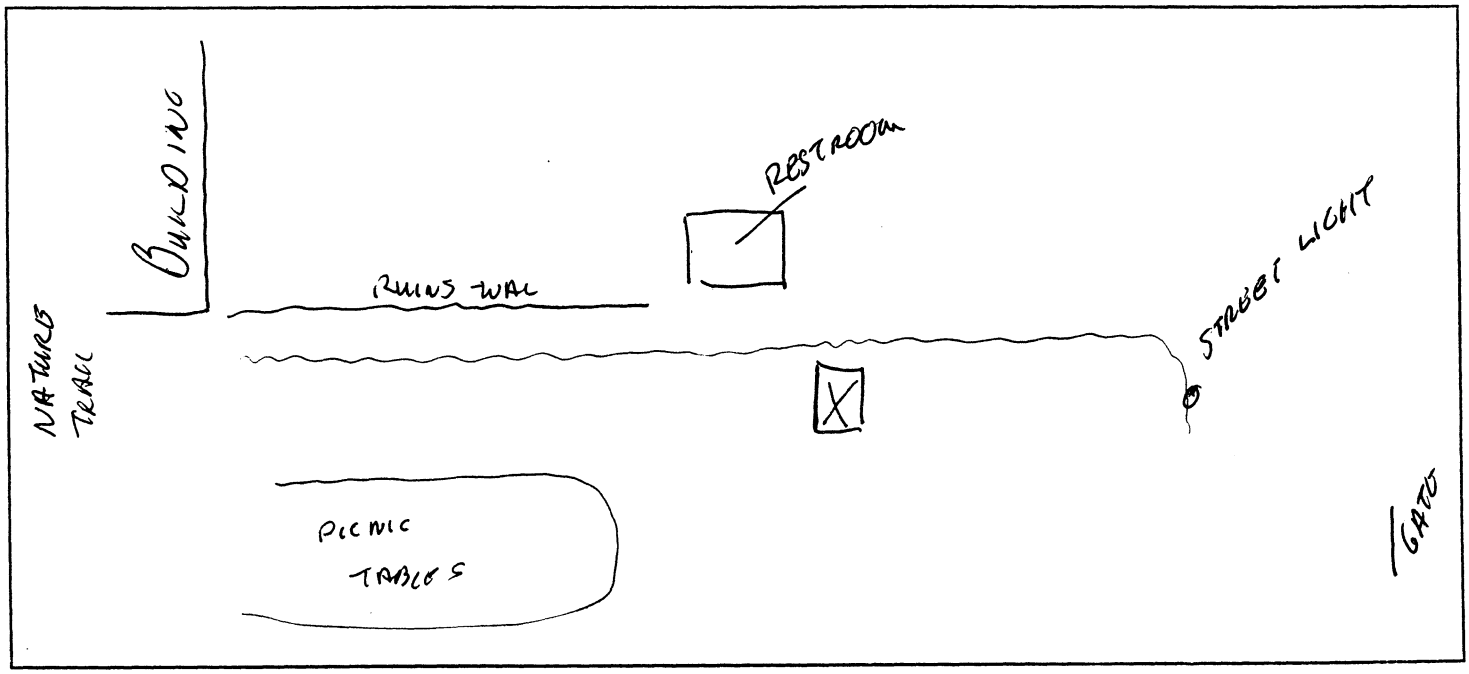
SAAN Unit (see map on back): SEE BACK, IN PARKING LOT

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

DECTECTOR - C AT 35 kHz

83° LT WIND

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



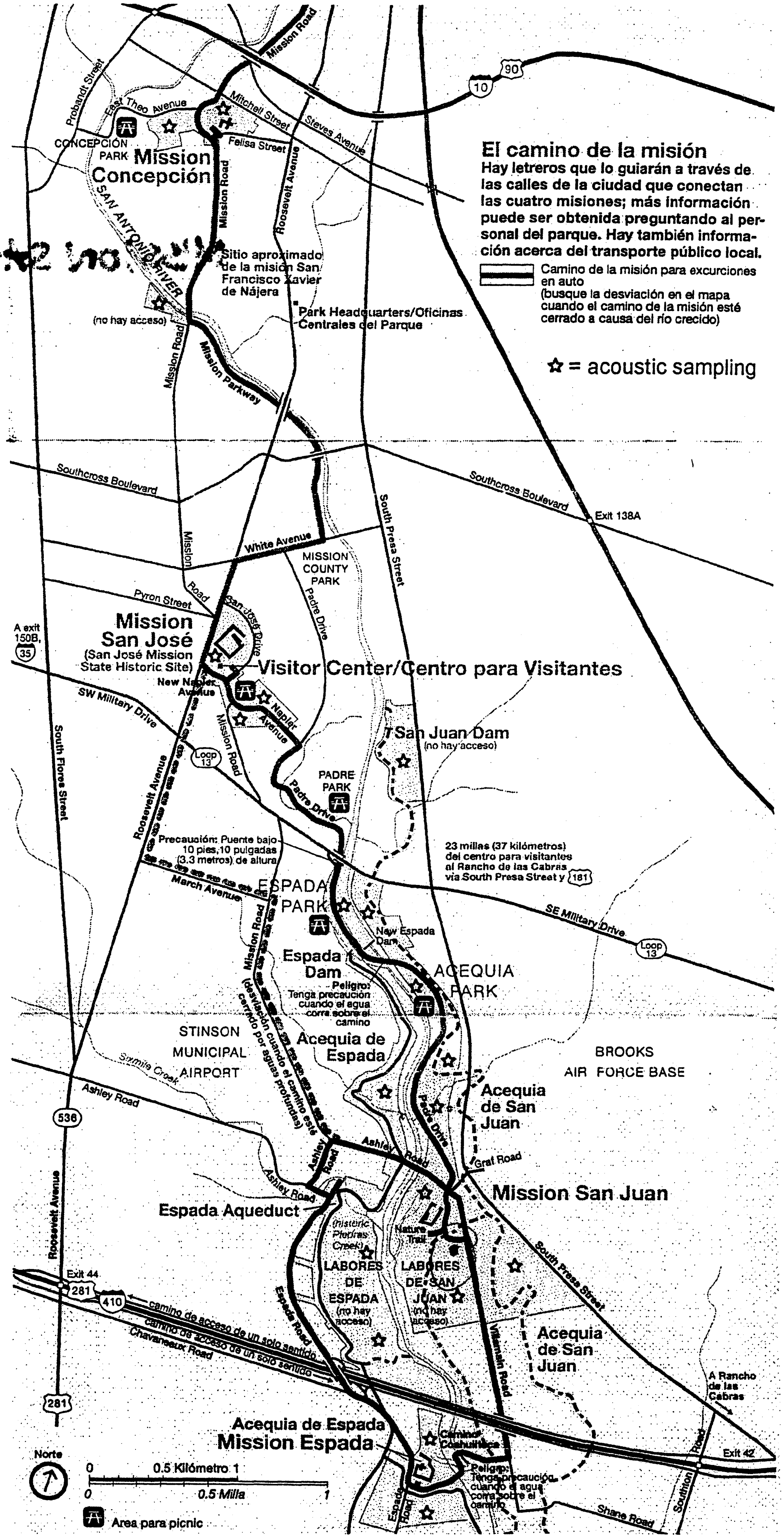
GPS coordinates (NAD 27): Zone: 14 Northing: 0552967 Easting: 3244680

Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use ||| tally)

7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
			59				
			28				

30 MIN BREAK WHILE MIST NETTING. Hajek



El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Road
Probandt Street
East Theo Avenue
Mitchell Street
Steves Avenue
Felisa Street
CONCEPCIÓN PARK
Mission Concepción
Roosevelt Avenue
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Parkway
Southcross Boulevard
Exit 138A
South Presa Street
White Avenue
MISSION COUNTY PARK
Padre Drive
Pyron Street
Mission San José
(San José Mission State Historic Site)
A exit 150B
Visitor Center/Centro para Visitantes
New Napier Avenue
Napier Avenue
SW Military Drive
Loop 13
San Juan Dam
(no hay acceso)
PADRE PARK
South Flores Street
Precaución: Puente bajo 10 pies,10 pulgadas (3.3 metros) de altura
23 millas (37 kilómetros) del centro para visitantes al Rancho de las Cabras vía South Presa Street y 181
March Avenue
ESPADA PARK
SE Military Drive
New Espada Dam
Espada Dam
Peligro: Tenga precaución cuando el agua corra sobre el camino
ACEQUIA PARK
(desviación cuando el camino esté cerrado por aguas profundas)
STINSON MUNICIPAL AIRPORT
Sixmile Creek
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
Graf Road
Mission San Juan
Espada Aqueduct
(historic Piedras Creek)
Nature Trail
LABORES DE ESPADA (no hay acceso)
LABORES DE SAN JUAN (no hay acceso)
Exit 44
281
410
camino de acceso de un solo sentido
Chavaneaux Road
Espada Road
Villamain Road
A Rancho de las Cabras
Acequia de Espada
Mission Espada
Camino Coahuilteca
Peligro: Tenga precaución cuando el agua corra sobre el camino
Exit 42
Shane Road
Southton Road
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Área para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: ANTON PAUL HAJEK III Date: 7 AUG 2002

Assistant Surveyors: HOLLY CAMERO

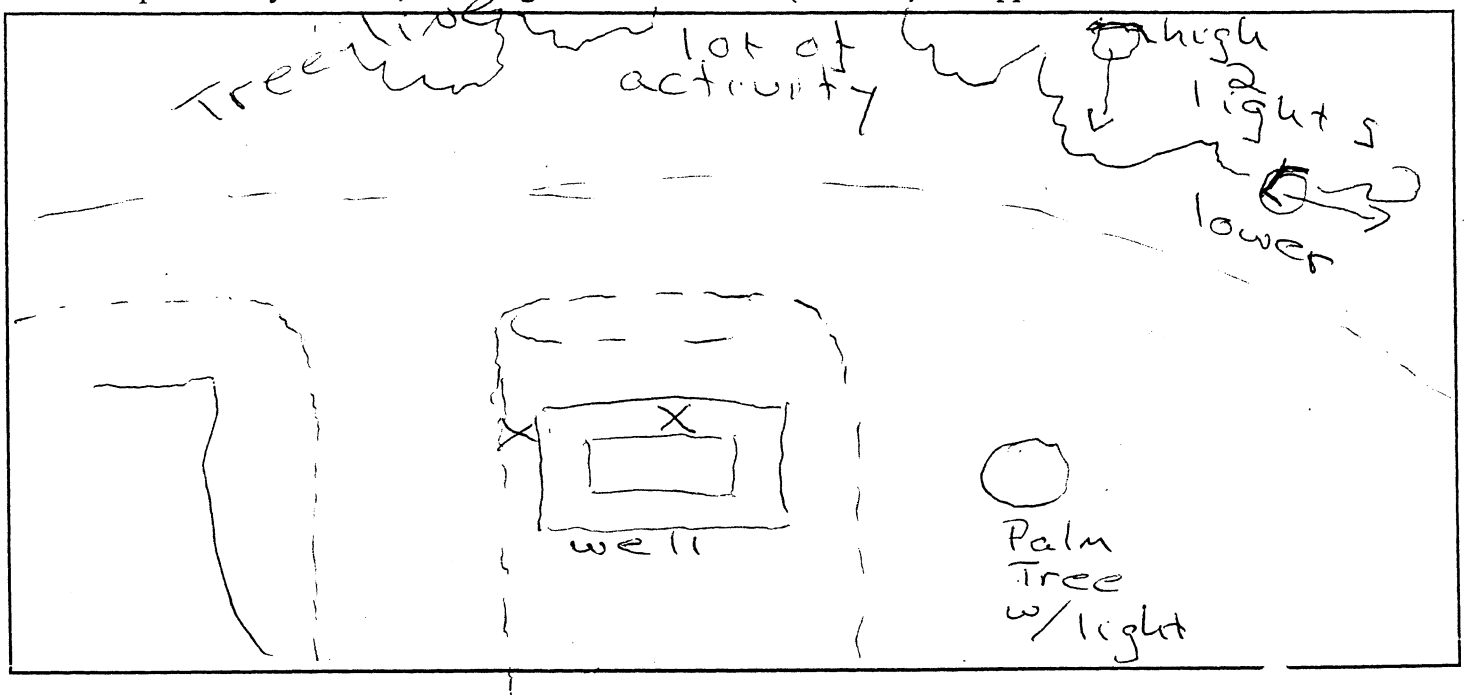
SURVEY LOCATION MISSION CONCEPTION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

90° @ nine PM new moon DRY

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



GPS coordinates (NAD 27): Zone: 14 Northing: 0549372 Easting: 3251207

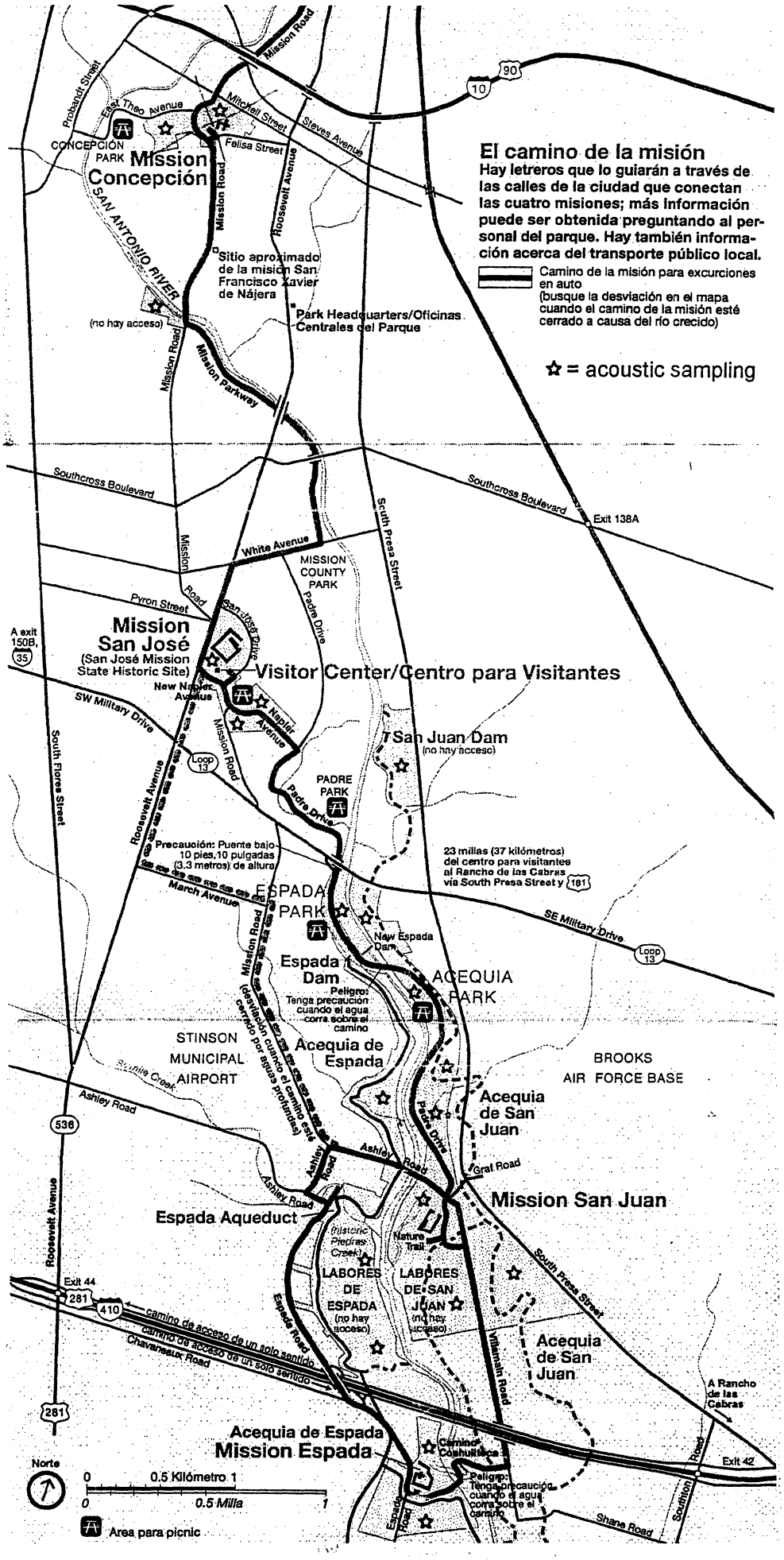
Bat detector used (set frequency to 30-35 kHz):

H 35 D60-5 HITS

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls			81	155	52	75		
Buzzes			39	85	25	37		

MANY BUZZES W/O ECHOS
MANY LIGHTS


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excurciones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Nájera
Park Headquarters/Oficinas Centrales del Parque
(no hay acceso)
Mission Parkway
Southcross Boulevard
Exit 138A
MISSION COUNTY PARK
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
San José Drive
Padre Drive
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente bajo 10 pies,10 pulgadas (3.3 metros) de altura
23 millas (37 kilómetros) del centro para visitantes al Rancho de las Cabras via South Presa Street y
ESPADA PARK
New Espada Dam
Espada Dam
Peligro: Tenga precaución cuando el agua corra sobre el camino
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
(desviación cuando el camino está cerrado por aguas profundas)
BROOKS AIR FORCE BASE
Acequia de San Juan
Mission San Juan
Espada Aqueduct
LABORES DE ESPADA (no hay acceso)
LABORES DE SAN JUAN (no hay acceso)
Nature Trail
Acequia de San Juan
camino de acceso de un solo sentido
Acequia de Espada
Mission Espada
A Rancho de las Cabras
Peligro: Tenga precaución cuando el agua corra sobre el camino
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Area para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: David Gates

Date: 8/8/02

Assistant Surveyors:

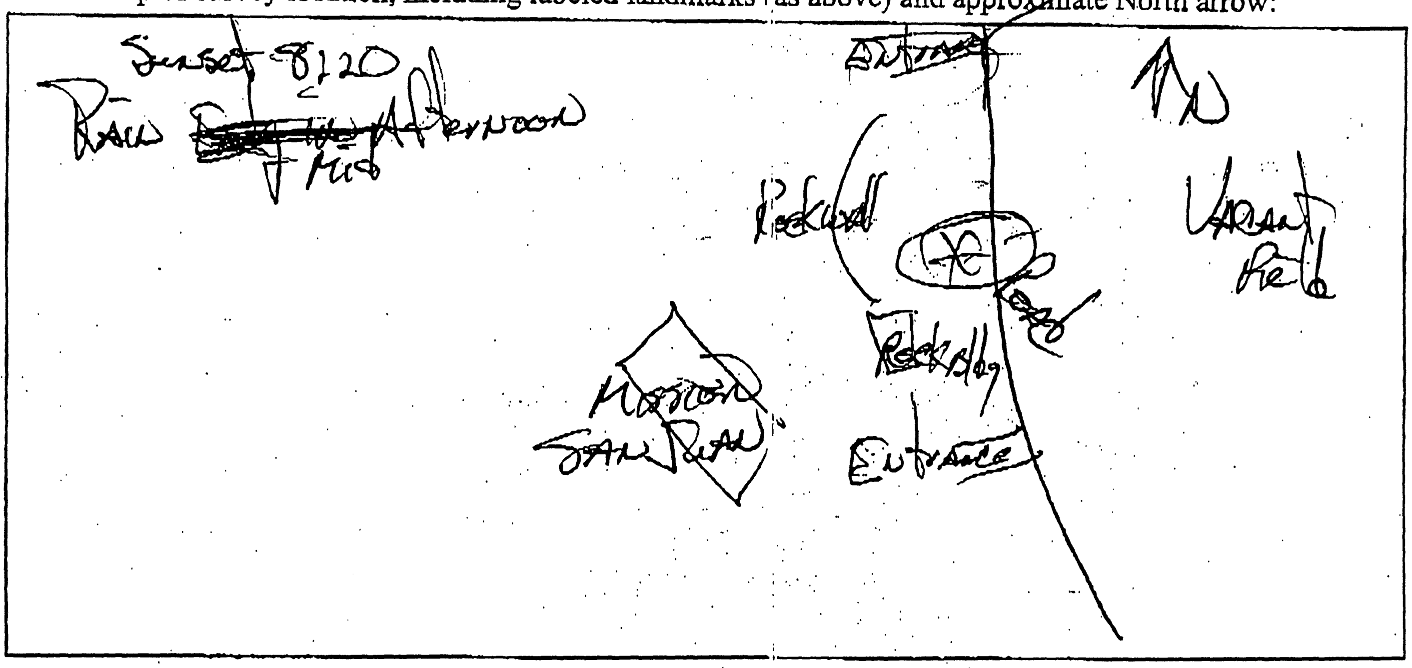
SURVEY LOCATION

SAAN Unit (see map on back): MISSION SAN JUAN

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Along Road - by Cable Fence -

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz): 33.2 KHz

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

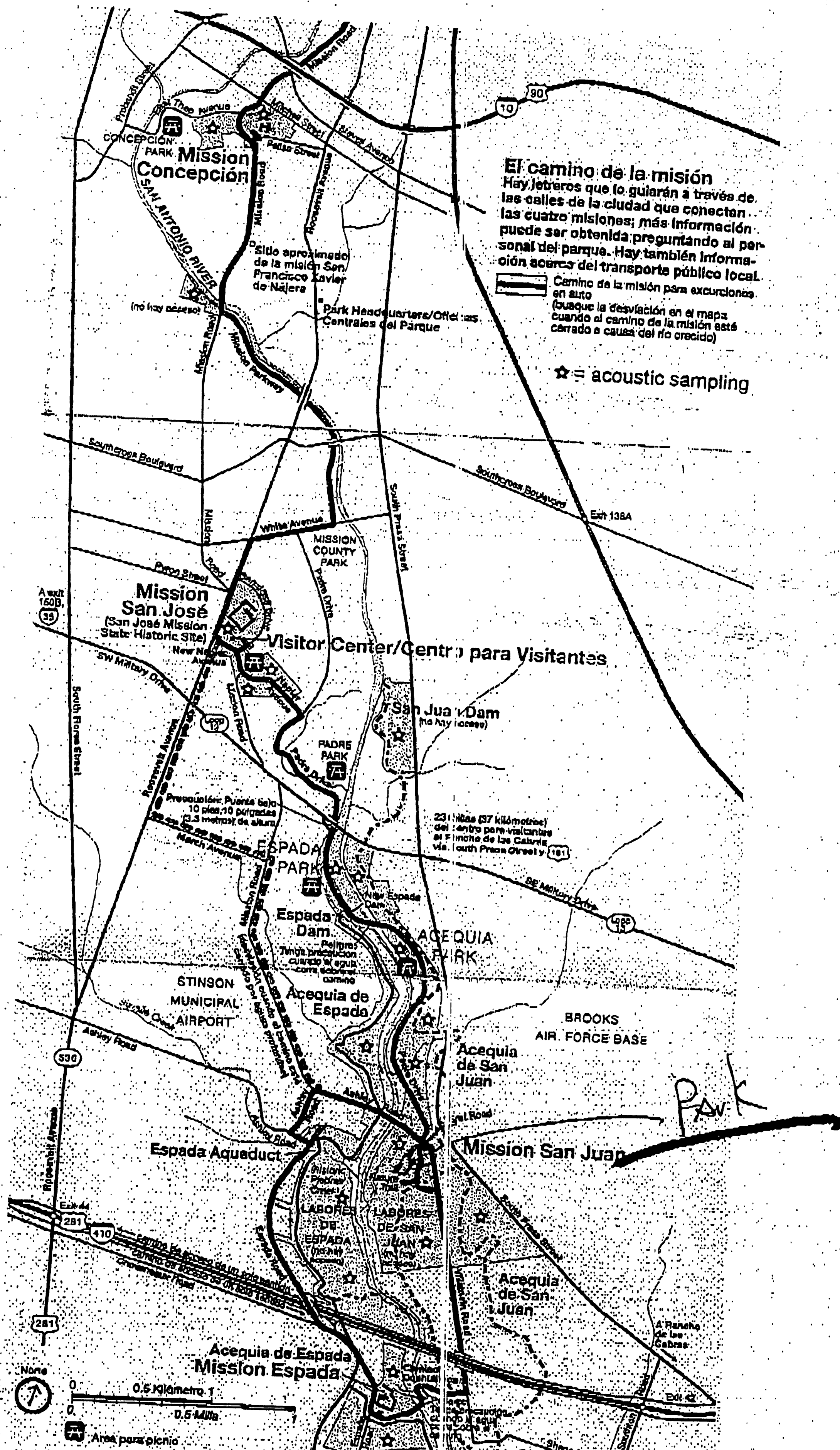
Start 8:05

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30 (9:00-9:15)	9:30-10:00 (9:15-9:30)	10:00-10:30 (9:30-10:00)	10:30-11:00	11:00-11:30
Bat Calls		I	[illegible]	II Almost constant chatter 9:10 stopped for 68	[illegible] By 10:30 Nothing	[illegible]		
Buzzes			[illegible]	[illegible]				

*One Bat circle Vacant Field, Diving & turning 3 times

WANT MORE MISSION

8/8


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Southcross Boulevard
Exit 138A
White Avenue
MISSION COUNTY PARK
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
San Juan Dam
(no hay acceso)
PADRE PARK
ESPADA PARK
Espada Dam
SW Military Drive
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Park
Espada Aqueduct
Mission San Juan
LABORES DE ESPADA
LABORES DE SAN JUAN
Acequia de San Juan
Acequia de Espada
Mission Espada
North
0.5 Kilómetro 1
0.5 Milla 1
Área para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: David Gates

Date: 8/15/0?

Assistant Surveyors:

SURVEY LOCATION

SAAN Unit (see map on back): Mission Concepcion

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

1/2 Moon 8:45 Clouds move In

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz): G - 0 Parked in

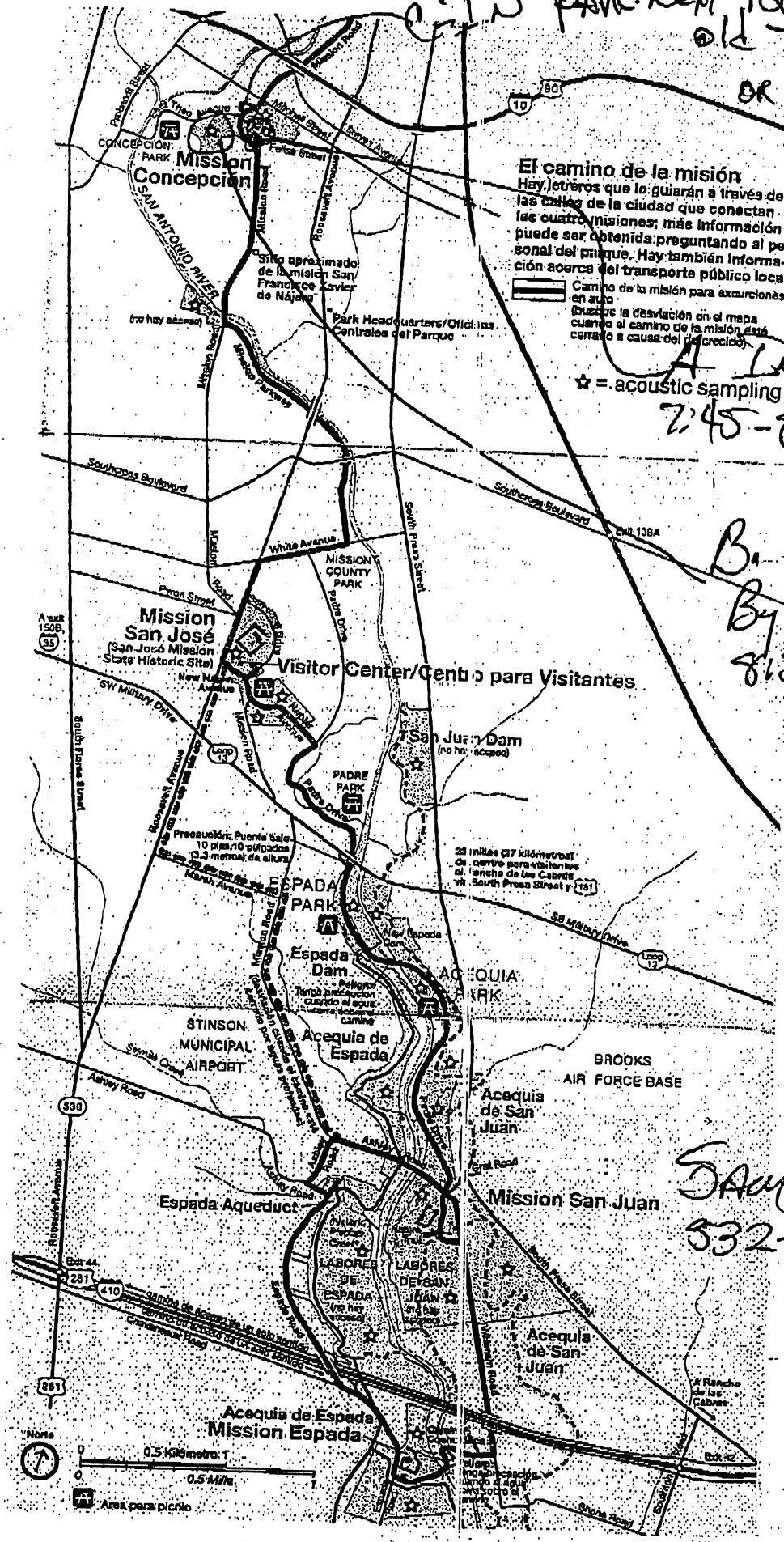
TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

	~~7:50~~ 7:45-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	Ø Freq 50.8	Ø	卌 卌 卌 I	卌 卌 卌 III		Area Thrown Out		
Feeding Buzzes	Ø	Ø	I	III				

Overly

8/15

CTN Park. Next to Cheaney @ Old Tennis Court OR Parking Lot on Grounds.



A. CTN Parking Lo
7:45 - 8:30 Freq 50.9

B. Vacant Fie
By Backstop
8:30 - Freq 42.4

San Juan
532-3126

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: ANTON HAJEK

Date: 17 AUG 02

Assistant Surveyors:

KATHY GAUDET

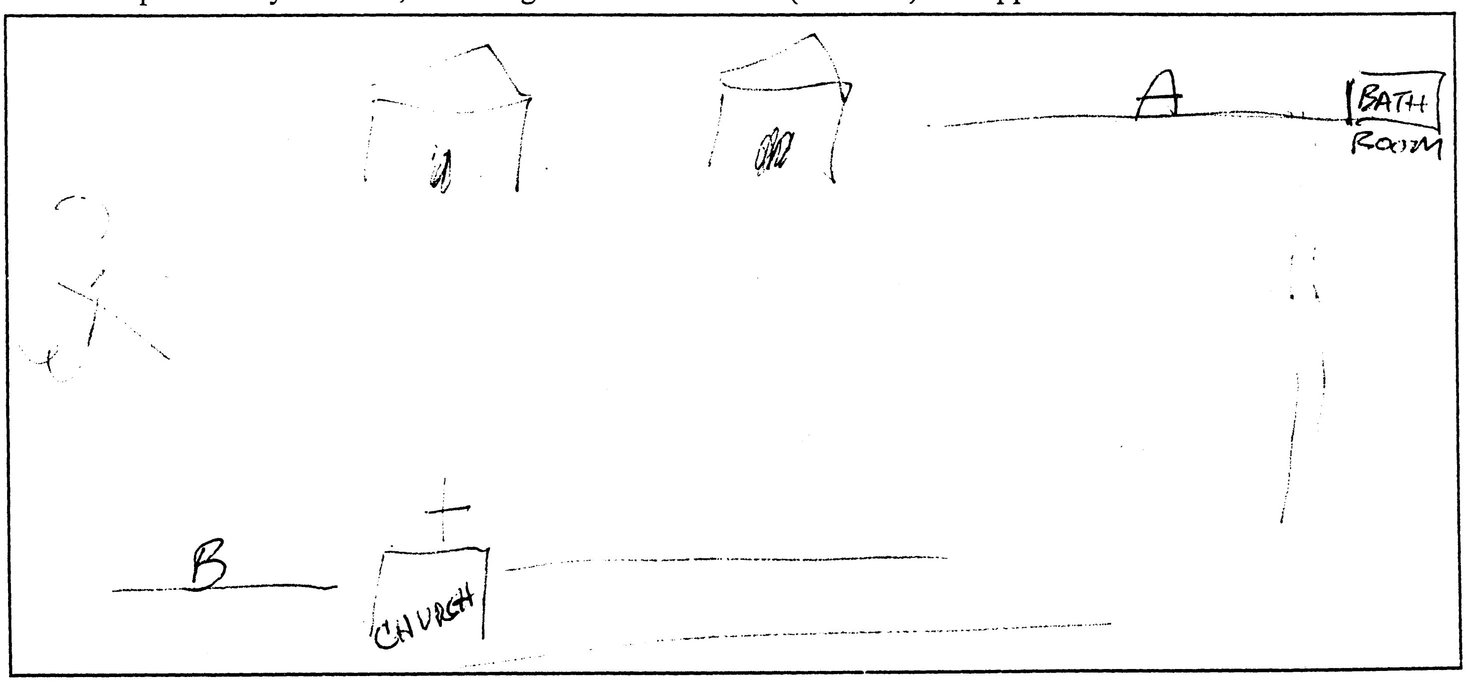
SURVEY LOCATION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

MISSION SAN JUAN LIGHT WIND 85° AT 9PM

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



GPS coordinates (NAD 27): Zone: 14

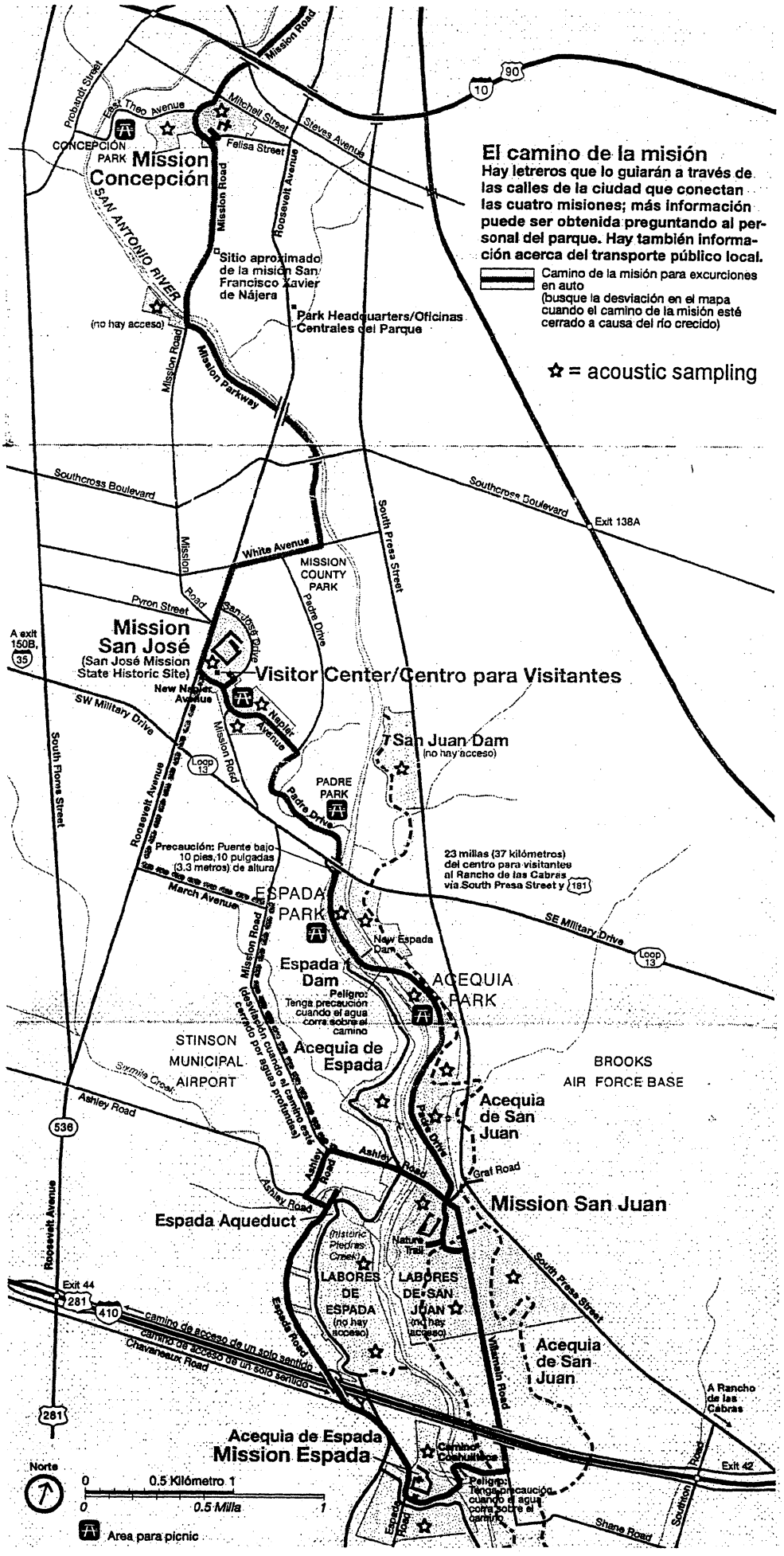
Northing: 05529 71 A / 18 B

Easting: 3244 699 A / 774 B

Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use ~~||||~~ tally)

7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
		28	25				
		9	10				


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excurciones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Nájera
Park Headquarters/Oficinas Centrales del Parque
(no hay acceso)
Mission Parkway
Southcross Boulevard
Exit 138A
MISSION COUNTY PARK
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
San José Drive
Padre Drive
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente bajo 10 pies,10 pulgadas (3.3 metros) de altura
23 millas (37 kilómetros) del centro para visitantes al Rancho de las Cabras via South Presa Street y
ESPADA PARK
New Espada Dam
Espada Dam
Peligro: Tenga precaución cuando el agua corra sobre el camino
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
(destapón cuando el camino está cerrado por aguas profundas)
BROOKS AIR FORCE BASE
Acequia de San Juan
Mission San Juan
Espada Aqueduct
(historic Piedras Creek)
LABORES DE ESPADA
(no hay acceso)
LABORES DE SAN JUAN
(no hay acceso)
Nature Trail
Acequia de San Juan
Camino de acceso de un solo sentido
Chavaneaux Road
Acequia de Espada
Mission Espada
Camino Coahuiltecano
Peligro: Tenga precaución cuando el agua corra sobre el camino
A Rancho de las Cabras
Exit 42
Exit 44
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Area para picnic

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: HAJEK, ANTON PAUL III

Date: 21 AUG 2002

Assistant Surveyors:

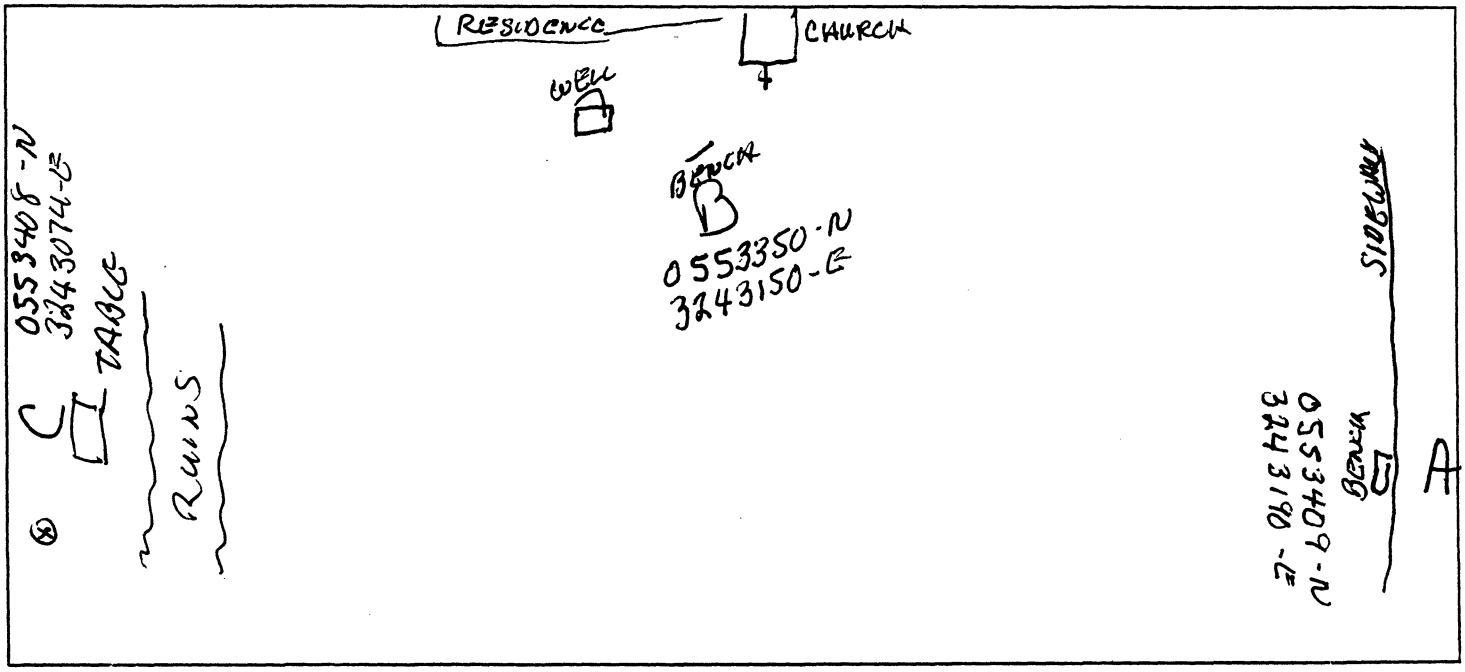
SURVEY LOCATION

SAAN Unit (see map on back): ESPADA

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

LT WIND CLOUDS FULL MOON
85°/8:30 9:00 WINDS INCREASED, GUSTY

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:



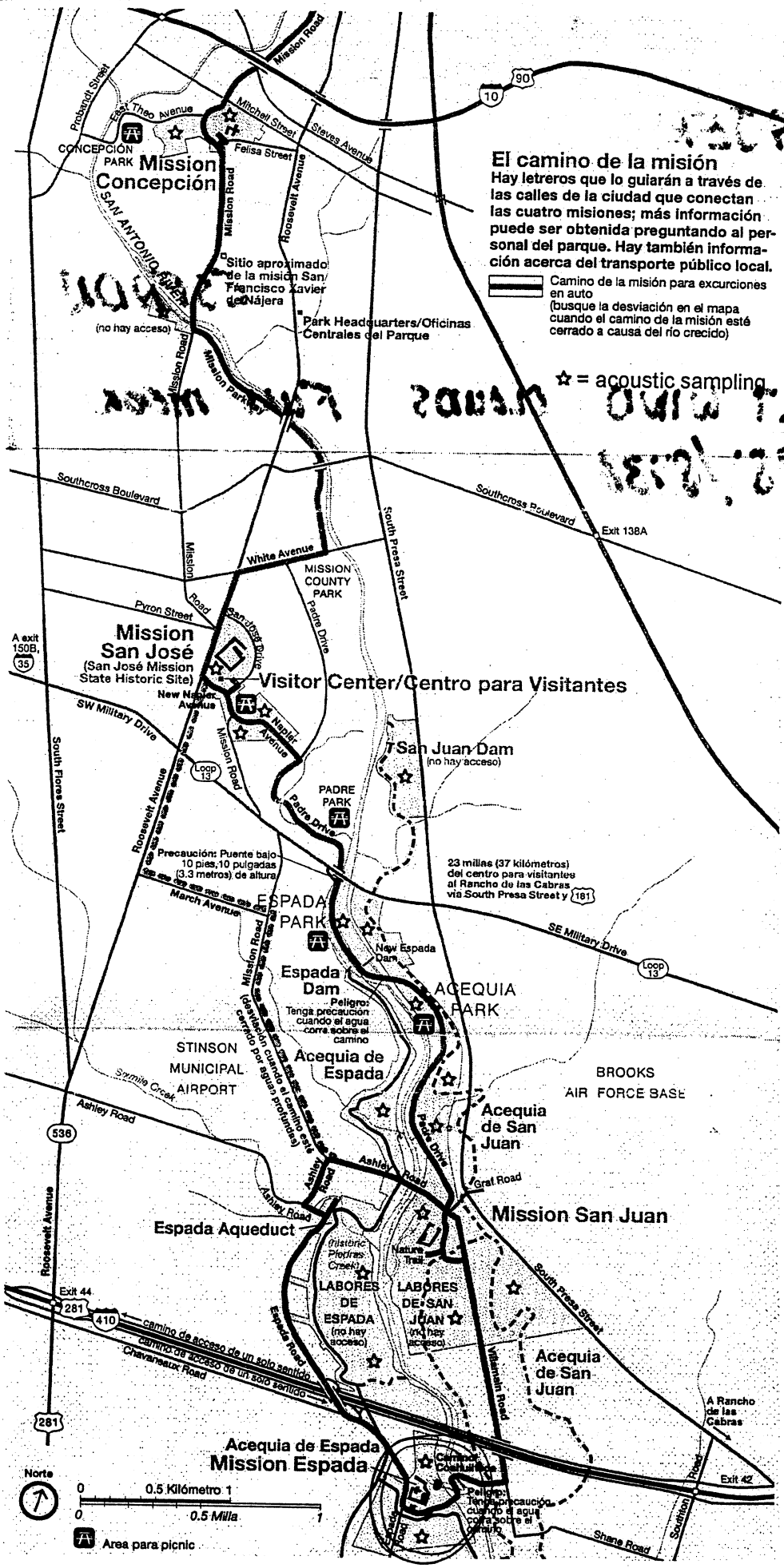
GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz): HAJEK'S PERSONAL 40 KHZ
0-200

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

945

7:30-8:00	8:00-8:30	8:~~30~~-9:00	9:00-9:30	9:30-~~10:00~~	10:00-10:30	10:30-11:00	11:00-11:30
		2	44 17 63	17			
		~~0~~	17	5			
		A	B	C			


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excurciones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Náejera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Park
Southcross Boulevard
Exit 138A
MISSION COUNTY PARK
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente bajo-10 pies,10 pulgadas (3.3 metros) de altura
23 millas (37 kilómetros) del centro para visitantes al Rancho de las Cabras via South Presa Street y 181
ESPADA PARK
New Espada Dam
Espada Dam
Peligro: Tenga precaución cuando el agua corra sobre el camino
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Mission San Juan
Espada Aqueduct
LABORES DE ESPADA (no hay acceso)
LABORES DE SAN JUAN (no hay acceso)
Acequia de San Juan
camino de acceso de un solo sentido
Acequia de Espada
Mission Espada
A Rancho de las Cabras
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Area para picnic

09/02/02 MON 12:51 FAX 2107360825 ESC - Diane Gates ☒004

Mission San Jose

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: David Gates Padre Park? Date: 8/22/02

Assistant Surveyors:

SURVEY LOCATION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Sun Down 8:10 P
Partly Cloudy
Temp - 95°F @ Sundown

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

Site A - On Street by Picnic Area 47.6 7:45-8:30
Near A Street Light
~~Site~~ Site B - In Field About 25' off Road About 8:30-
1/2 way between lights ~~on~~ Napier ~~3?~~
Wind started to pick up 34.6
out of S.E. Moon Rise 8:30? (Full?)

GPS coordinates (NAD 27): Zone: Northing: Easting:

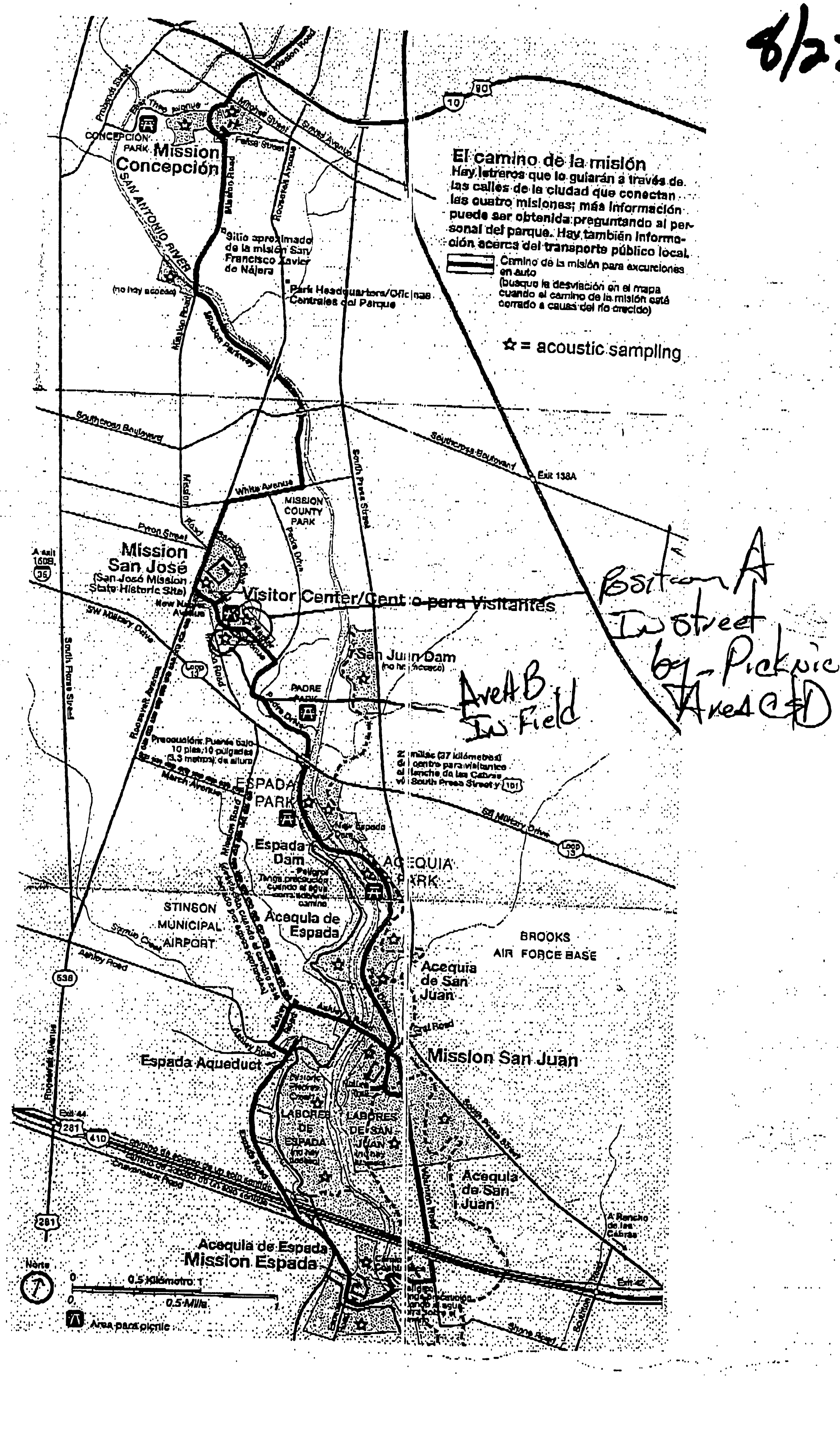
Bat detector used (set frequency to 30-35 kHz):

Freq 47.6 TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use 卌 tally)

	Dark		Open					
	~~7:30-8:00~~ 7:45-8:	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	Ø	Ø	卌 卌 (circled) 卌 卌 卌 卌 |||	卌 卌	卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌				
Feeding Buzzes			卌 || ⊗	卌 ||				

San Jose | Padre Park

8/22


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCION PARK
SAN ANTONIO RIVER
Mission Road
Roosevelt Avenue
Mitchell Street
Felisa Street
Steves Avenue
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Parkway
Southcross Boulevard
South Presa Street
Exit 138A
White Avenue
MISSION COUNTY PARK
Padre Drive
Pyron Street
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
SW Military Drive
San Juan Dam
PADRE PARK
ESPADA PARK
Espada Dam
New Espada Dam
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
Espada Aqueduct
Mission San Juan
LABORES DE ESPADA
LABORES DE SAN JUAN
Espada Road
Mission Espada
Acequia de Espada
Norte
0.5 Kilómetro 1
0.5 Milla 1
Área para picnic
Shane Road
Exit 42
Position A In street by Picnic Area C&D
Area B In Field

San Antonio Missions National Historic Park

Acoustic Bat Survey

Surveyor: David Gates

Date: 8/29/02

Assistant Surveyors: Mission Concepcion

SURVEY LOCATION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Rained This AM - Cloudy All Afternoon
Tem 80-85°

Sketch map of survey location, including labeled landmarks (as above) and approximate ~~North Arrow~~: Not Good Freq?

Position A - Started @ 7:30 Freq. (49.5 KHz then 47.4)
7:30-8:30 ↳ In Ball field by Backstop ~~Across Mission~~ from Church. Sun down @ 8:00 PM.

Position B - Moved @ 8:30 Freq 36.7
8:30-9:00 In Field In Front of Church. Under 2 Mesquite Trees

~~Sky Clear by 8:45~~

Position C Walked Around Front of Church - & office
9:00-9:30

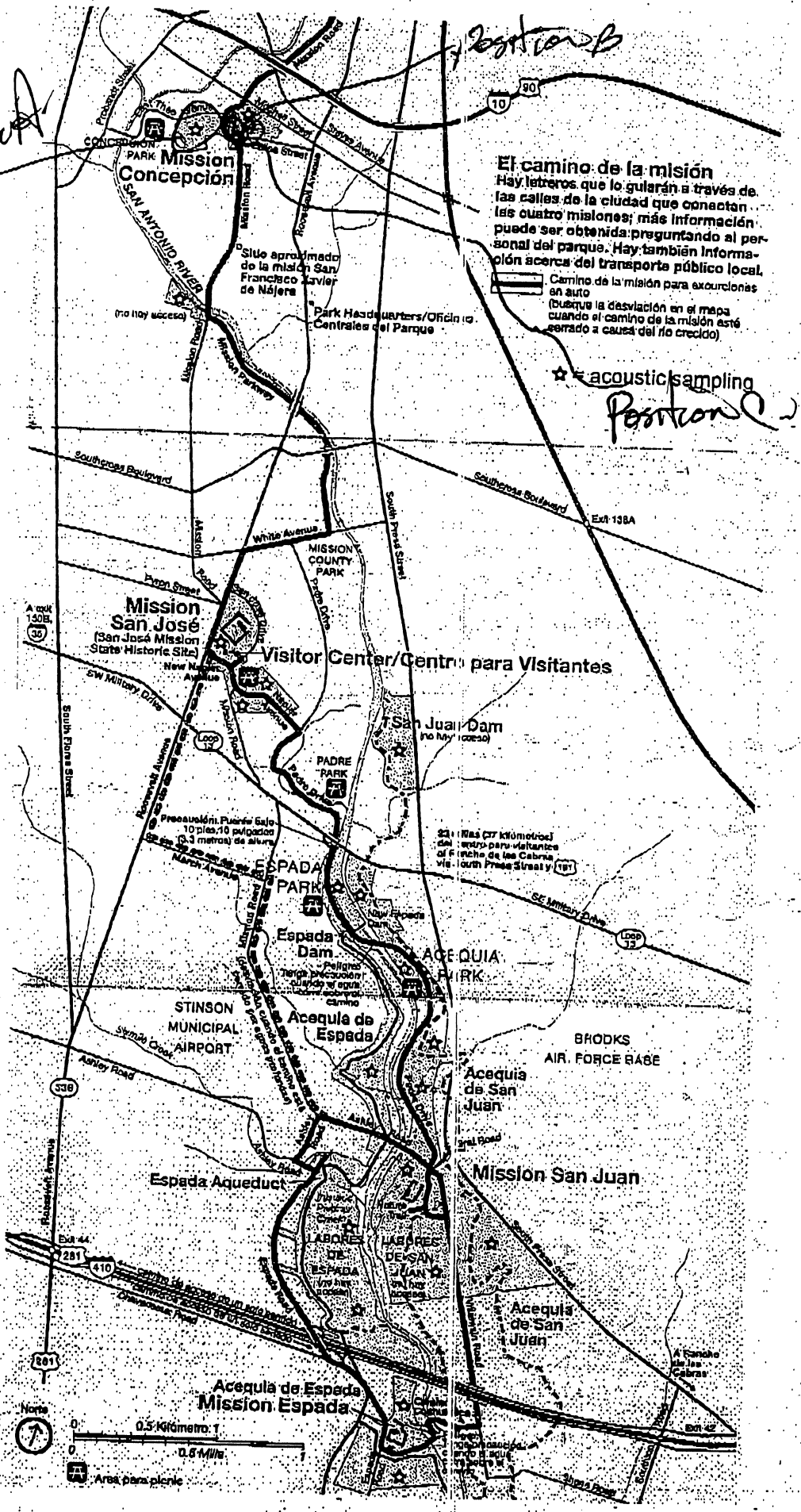
GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use ~~||||~~ tally)

Freq	49.5	47.4	36.7	36.6				
	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	||	|	[tally marks] ~~Almost Constant~~ [tally marks] Several Bats At a time [tally marks]	~~||||~~ ||| 8:49 - Almost stopped ~~||||~~ |	||||			
Feeding Buzzes			[tally marks]	|||				
	Pos A	Pos A	Pos B	Pos B	F. 36.6			

8/29


Mission Concepción
CONCEPCION PARK
SAN ANTONIO RIVER
Mission Road
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Parkway
El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Position 2
Position 3
Southcross Boulevard
Exit 138A
White Avenue
MISSION COUNTY PARK
South Presa Street
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
SW Military Drive
San Juan Dam
(no hay acceso)
PADRE PARK
Precaución: Puente Bajo 10 pies,10 pulgadas (3.3 metros) de altura
ESPADA PARK
Espada Dam
Peligros
Tenga precaución cuando el agua sobrepasa el camino
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
Acequia de Espada
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
Espada Aqueduct
Mission San Juan
LABORES DE ESPADA
LABORES DE SAN JUAN
Acequia de San Juan
Rancho de las Cabras
Acequia de Espada
Mission Espada
Norte
0.5 Kilómetro 1
0.5 Milla 1
Area para picnic

Post-it® Fax Note 7671	Date 9/2/02	# of pages ▶ 1
To Meg	From David Gates	
Co./Dept	Co.	
Phone #	Phone #	
Fax # 512-972-7055	Fax # 210-736-0825	

s National Historic Park

Bat Survey

9/5/02

Date: 9/5/02

Assistant Surveyors: _____

SURVEY LOCATION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Warm Partly Cloudy. Sunset 7:50
No Moon -

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

Mission Espada
Position A - In Field South of Mission Grounds
Freq. 47.9 7:30 -
Freq 40.5 - 8:00
Position B - Just outside of wall due East of Church
8:42 First Sound
Freq 35.6 - 8:30
Freq 32.7 9:00 Just started to pickup when
I Left @ 9:30

GPS coordinates (NAD 27): Zone: Northing: Easting:

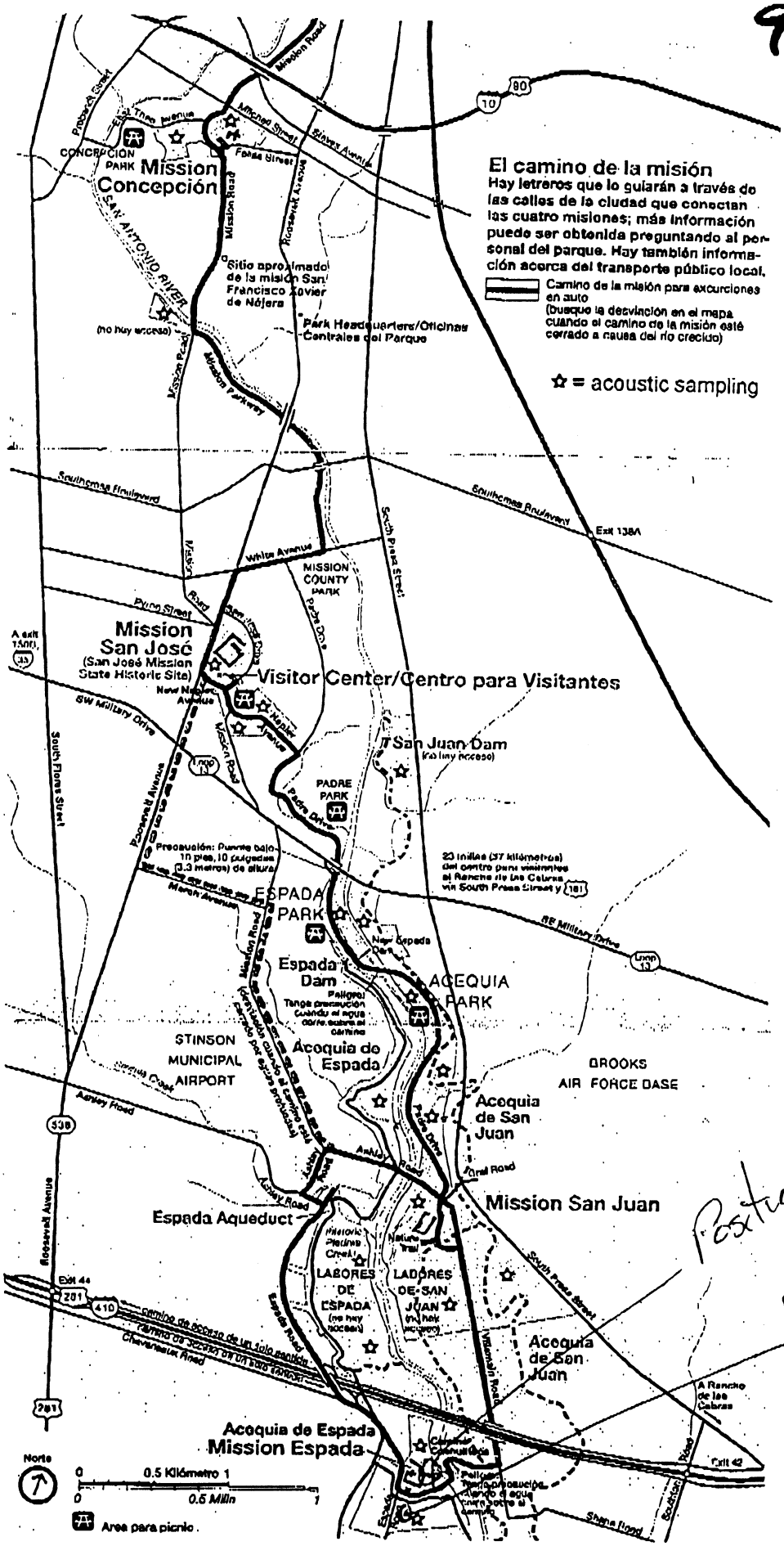
Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

Freq 47.9 40.5 35.6 32.7

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls		Asof 8:40 Not one Bat Sound. Can Hear Insects.	𝍸	𝍸 𝍸 𝍸				
Feeding Buzzes				1				
	Pos A.	Pos A	Pos B.	Pos B				

9/5/02



Position B.

Position A

SAAN

San Antonio Missions National Historic Park

Acoustic Bat Survey

9/19/02

Surveyor: David Cates

Date: 9/19/02

Assistant Surveyors: ~~[illegible]~~ -Casey my Dog.

SURVEY LOCATION

SAAN Unit (see map on back): MISSION SAN JOSE

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc so that others may find this exact spot in the future):

Rain This After Noon-
Installed New Battery
Sunset 7:45 Cloudy 85°+

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

Position A - 7:30 - 800 Freq 37.4
Lots of Mosquitos Deet no protection
Position B - 800 - Freq 35.1 / 35.0
See Lightning in Distance.

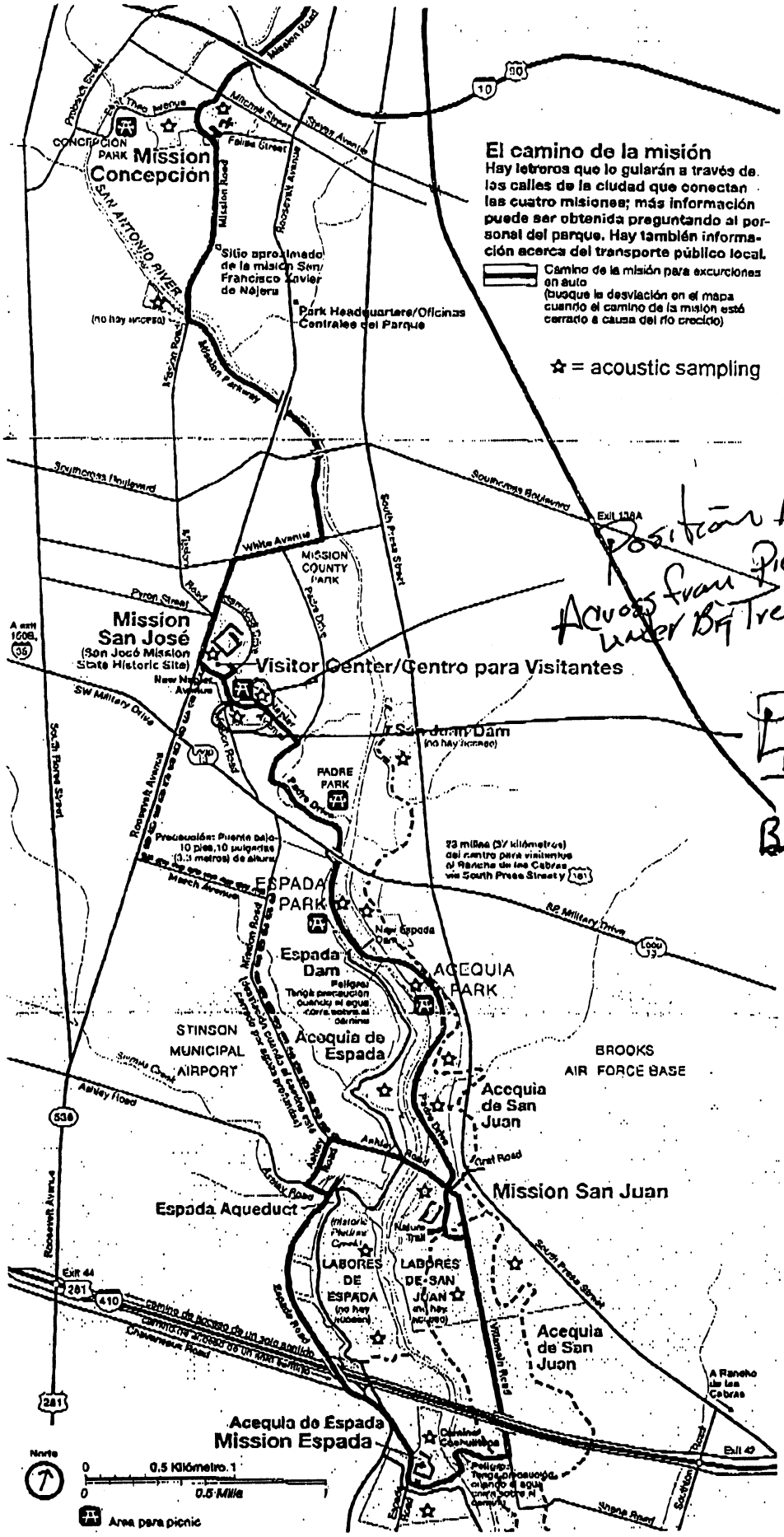
GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz):

Freq 37.4 35.1 35.0 TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	None.	II	𝍸 𝍸 𝍸 I					
Feeding Buzzes			III					
	Pos A	Pos B	Pos B					

9/19/02



Position B
Picnic Area
Across from
under BBQ Tree.

Position A.
In Field
25' off Road.
Between Lights

COPY

San Antonio Missions National Historic Park

Acoustic Bat Survey

9/26/02

Surveyor: David Gates

Date: 9/26/02

Assistant Surveyors: Casey
Ray Dog

SURVEY LOCATION

SAAN Unit (see map on back): MISSION SAN JUAN

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Sundown @ 7:30
Temp - 80°
Sky Clear ~~Lots of Fireflies~~

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

Position A: 7:45-8:30 Freq 36.0 Two Distinct Calls!!
Lots of Fireflies
8:10 everything stopped start again 8:17

Position B - 8:30 - Freq 36.0
Lots of Lights
by Church.

GPS coordinates (NAD 27): Zone: Northing: Easting:

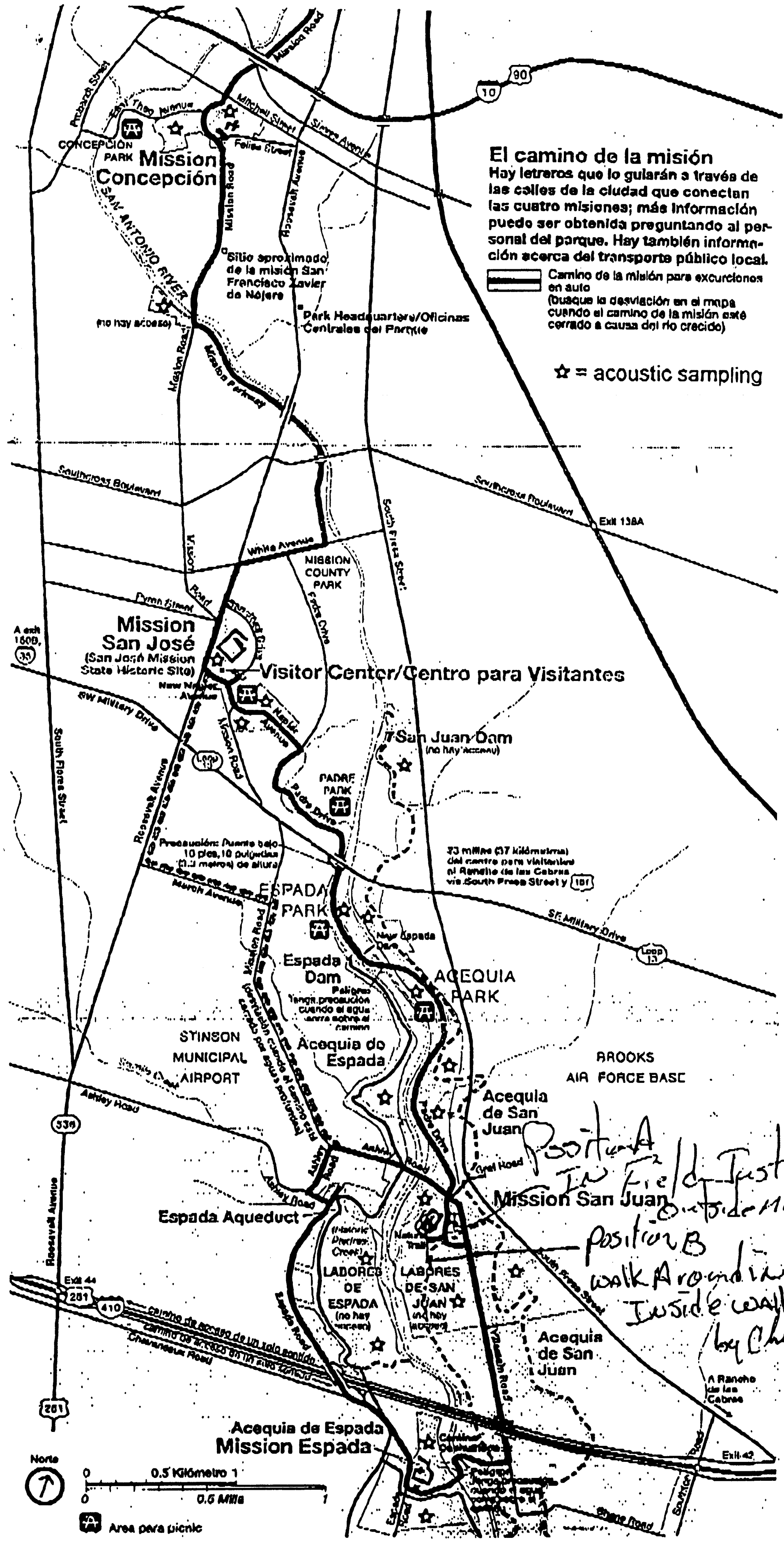
Bat detector used (set frequency to 30-35 kHz):

Freq 36 TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	𝍸 I	𝍸 𝍸 𝍸 III 𝍸 𝍸 III 𝍸 𝍸 II	𝍸 II					
Feeding Buzzes	I	𝍸 I						

FOA

9/26/02


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto (busque la desviación en el mapa cuando el camino de la misión esté cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Mission Road
Mitchell Street
Roosevelt Avenue
Sitio aproximado de la misión San Francisco Xavier de Nájera
(no hay acceso)
Park Headquarters/Oficinas Centrales del Parque
Mission Parkway
Southcross Boulevard
South Flores Street
Exit 138A
White Avenue
MISSION COUNTY PARK
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
SW Military Drive
San Juan Dam
(no hay acceso)
PADRE PARK
Padre Drive
Precaución: Puente bajo 10 pies, 10 pulgadas (3.3 metros) de altura
33 millas (57 kilómetros) del centro para visitantes al Rancho de las Cabras vía South Flores Street y 181
ESPADA PARK
SE Military Drive
Espada Dam
ACEQUIA PARK
Acequia de Espada
STINSON MUNICIPAL AIRPORT
BROOKS AIR FORCE BASE
Acequia de San Juan
Ashley Road
Mission San Juan
Espada Aqueduct
LABORES DE ESPADA
LABORES DE SAN JUAN
Espada Road
camino de acceso de un solo sentido
Chavaneaux Road
A Rancho de las Cabras
Acequia de Espada
Mission Espada
Norte
0.5 Kilómetro 1
0.5 Milla 1
Area para picnic
Position A In Field Just outside Mission
Position B walk Around in Field Inside walled Area by Church

San Antonio Missions National Historic Park

Acoustic Bat Survey

10/22/02

Surveyor: David Gates

Date: 10/22/02

Assistant Surveyors: Dowe

SURVEY LOCATION

SAAN Unit (see map on back): MISSION SAN JOSE

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Sunset 7:00

Rain Last Night & This Morning Full Moon yesterday?

Clear This Afternoon - Clouds Moving In @ 5:00

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

Position A Freq 35.5 6:30 - 7:30

Partly Cloudy waning Gibbous.

Lots of Misquitos

Position B. Freq - 33.6 7:30 - 8:30

Moon Rises 8:05

8:30 -

Position C. Freq - 35.0

GPS coordinates (NAD 27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz):

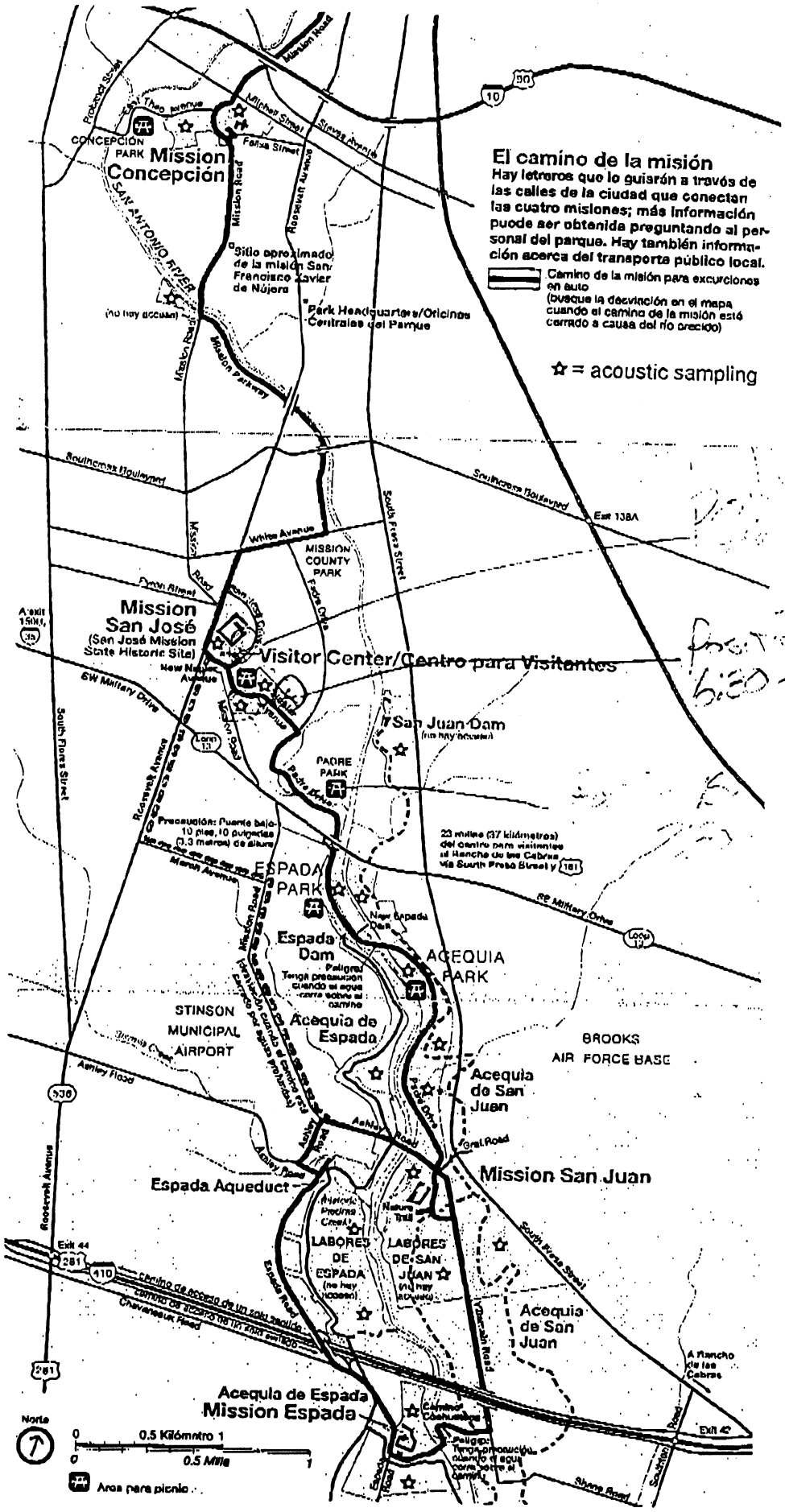
Position A 6:30-7:30

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use tally)

7:30-8:30 8:30-9:30 9:30-5:00

	6:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
Bat Calls	11	IIII	IIII	IIII IIII IIII IIII IIII III				
Feeding Buzzes			1	IIII				

10/22/02


El camino de la misión
Hay letreros que lo guiarán a través de las calles de la ciudad que conectan las cuatro misiones; más información puede ser obtenida preguntando al personal del parque. Hay también información acerca del transporte público local.
Camino de la misión para excursiones en auto
(busque la desviación en el mapa cuando el camino de la misión está cerrado a causa del río crecido)
☆ = acoustic sampling
Mission Concepción
CONCEPCIÓN PARK
SAN ANTONIO RIVER
Sitio aproximado de la misión San Francisco Xavier de Náojera
Park Headquarters/Oficinas Centrales del Parque
Mission San José
(San José Mission State Historic Site)
Visitor Center/Centro para Visitantes
MISSION COUNTY PARK
PADRE PARK
San Juan Dam
ESPADA PARK
Espada Dam
Peligro! Tenga precaución cuando el agua corra sobre el camino
Acequia de Espada
ACEQUIA PARK
STINSON MUNICIPAL AIRPORT
BROOKS AIR FORCE BASE
Acequia de San Juan
Mission San Juan
Espada Aqueduct
LABORES DE ESPADA
LABORES DE SAN JUAN
Acequia de San Juan
Acequia de Espada
Mission Espada
A Rancho de las Cabras
Norte
0 0.5 Kilómetro 1
0 0.5 Milla 1
Area para picnic

Acoustic Bat Survey Protocol for the San Antonio Missions Bat Inventory Project

Thanks for your help! Your assistance is especially helpful on this project. Attached is the survey sheet that needs to be filled out completely every time you go into the field. A few guidelines to follow while carrying out the survey are listed below:

1) First, you will need to check out a bat detector. We have a total of eight detectors that can be checked out from Anton Hajek. Please take great care while in possession of these detectors as each is expensive and necessary for BCI to carry out their work.
2) Once you decide where you are going to monitor for the evening, please either let Anton know when you check out the detector or please email Meg so that we can keep track of which sites have already been monitored.
3) You can go out into the filed to monitor for bats from at least 30 minutes before sundown until any time throughout the evening.
4) As we are trying to get a complete picture of where the bats are, we suggest that you start at the edge of the determined site and move at least 50 yard every 30 minutes. If you stand only in one site (i.e. by a light post) for the entire time we would be getting biased information as we already know that bats frequent areas where there are lights drawing in the insects. It would be most helpful to move about and record your data so that we may understand where the bats are foraging over the entire site. We understand that the missions after dark are not necessarily the safest place to be by your self; therefore we suggest you form small groups to perform the monitoring activity.
5) Once in the field, please record all necessary information on the form, such as name, time and location. It is also essential that you draw a map of your monitoring areas as close to accurate as possible. We suggest that you label each time you move on your map with A, B, C, etc. and also label the time block at the bottom of the form to coincide. Don't worry if you are not an artist; we are most interested if you were in a field versus a riparian area for example, and at what times.
6) Once you have completed your survey, please return your bat detector and survey form to Anton. Another option is if you know you plan to monitor for bats each week until the survey is complete in October, you can check out the bat detector for the entire time and mail your completed forms to Meg at Texas Parks and Wildlife: 3000 S. IH 35 Suite 100, Austin, Texas 78704. Just let Anton know what your intentions are when you check out the bat detector.

Thanks again for your help. Please feel free to contact any of us if you have any questions or concerns.

Meg Goodman 512-912-7042/512-327-9721, meg.goodman@tpwd.state.tx.us
Jim Kennedy 512-327-9732, jkennedy@batcon.org
Julie Jenkins 512-327-9721, jjenkins@batcon.org

Appendix 2:

Acoustic Bat Survey Protocol for the San Antonio Missions Bat Inventory Project

Thanks for your help! Your assistance is especially helpful on this project. Attached is the survey sheet that needs to be filled out completely every time you go into the field. A few guidelines to follow while carrying out the survey are listed below:

1) First, you will need to check out a bat detector. We have a total of eight detectors that can be checked out from Anton Hajek. Please take great care while in possession of these detectors as each is expensive and necessary for BCI to carry out their work.

2) Once you decide where you are going to monitor for the evening, please either let Anton know when you check out the detector or please email Meg so that we can keep track of which sites have already been monitored.

3) You can go out into the field to monitor for bats from at least 30 minutes before sundown until any time throughout the evening.

4) As we are trying to get a complete picture of where the bats are, we suggest that you start at the edge of the determined site and move at least 50 yards every 30 minutes. If you stand only in one site (i.e. by a light post) for the entire time we would be getting biased information as we already know that bats frequent areas where there are lights drawing in the insects. It would be most helpful to move about and record your data so that we may understand where the bats are foraging over the entire site. We understand that the missions after dark are not necessarily the safest place to be by your self; therefore we suggest you form small groups to perform the monitoring activity.

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San Antonio Missions National Historical Park

Acoustic Bat Survey

Surveyor: Date:

Assistant Surveyors:

SURVEY LOCATION

SAAN Unit (see map on back):

Description of location within area surveyed (include distances and directions to landmarks such as streets, gates, waterways, buildings, trees, etc. so that others may find this exact spot in the future):

Sketch map of survey location, including labeled landmarks (as above) and approximate North arrow:

GPS coordinates (NAD27): Zone: Northing: Easting:

Bat detector used (set frequency to 30-35 kHz):

TIME PERIODS AND NUMBERS OF BAT CALLS RECORDED (use |||| tally)

	7:30-8:00	8:00-8:30	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30
bat calls								
feeding buzzes								